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Report on the consumpton of vegetables and fruit in NSW

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Report on the consumpton of vegetables and fruit in NSW

Abstract
Increasing vegetable and fruit consumption in the New South Wales population is a key public health priority. There is little dispute that high vegetable and fruit consumption confers significant health benefits. Epidemiological evidence indicates that increasing intakes of vegetables and fruit decreases the risk of major chronic diseases including cancer, coronary heart disease, stroke, type 2 diabetes, diverticulitis, cataracts, macular degeneration, and chronic obstructive pulmonary disease. For optimal health benefits, the importance of consuming a variety of vegetables and fruit is stressed. It is also important that there appears to be a dose-response relationship between vegetable and fruit consumption and protection from ill health. Thus, important gains can be made by increasing consumption across all intake levels. It has been estimated, conservatively, that 3% of the total burden of disease in Australia is attributable to a low intake of vegetables and fruit. Expressed economically, the potential savings to the national health care system of increasing average vegetable consumption by only one serve per day is $24.4 million per year for colorectal, breast, lung, and prostate cancer alone.

Keywords
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State of Food and Nutrition in NSW Series

Report on the consumption of vegetables and fruit in NSW: 2003

The University of Sydney

NSW HEALTH
Working as a Team

The NSW Centre for Public Health Nutrition is funded by the NSW Department of Health and supported by the Sydney Nutrition Research Foundation

State of Food and Nutrition in NSW Series:

Report on the consumption of vegetables and fruit in NSW: 2003

A NSW Centre for Public Health Nutrition report for the NSW Nutrition and Physical Activity Branch (NUPA), NSW Centre for Health Promotion, NSW Department of Health.

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NSW Health website. **www.health.nsw.gov.au**

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List of abbreviations

ABS	Australian Bureau of Statistics
AFNMU	Australian Food and Nutrition Monitoring Unit
AGHE	Australian Guide to Healthy Eating
AHS	Area Health Service
AICR	American Institute for Cancer Research
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index for Australia
ASSAD	Australian School Students' Alcohol and Drugs Survey
BMI	Body mass index
CATI	Computer assisted telephone interview
COPD	Chronic obstructive pulmonary disease
COMA	Committee of Medical Aspects of Food and Nutrition Policy
CVD	Cardiovascular disease
DAA	Dietitians Association of Australia
DALY	Disability adjusted life year
DASH	Dietary approaches to stop hypertension
DGA	Dietary guidelines for Australians
DGCA	Dietary guidelines for children and adolescents
EPIC	European Prospective Investigation into Cancer and Nutrition
HDWA	Health Department of Western Australia
HFAB	Healthy Food Access Basket
HT	Hypertension
NHMRC	National Health and Medical Research Council
NNS	National Nutrition Survey 1995
NSW HS	New South Wales Health Survey
NSW CHS	New South Wales Child Health Survey 2001
NZMOH	New Zealand Ministry of Health
PAR	Population attributable risk
QHFAB	Queensland 2000 Healthy Food Access Basket
RDI	Recommended dietary intakes
RSE	Relative standard error
SEIFA	Australian Bureau of Statistics socioeconomic indices for areas
USDA	United States Department of Agriculture
WCRF	World Cancer Research Fund
WHO	World Health Organisation
YLD	Year equivalents lost due to severity-adjusted disability
YLL	Years of life lost

Glossary

Confidence interval

A confidence interval is a range of values that includes the parameter with known probability, called the confidence level. The confidence level represents the probability that a sample will actually have the value of the parameter in the confidence interval.

DALYs

Disability-adjusted life years (DALY). One DALY is a lost year of 'healthy life'. It is calculated as a combination of years lost due to premature death (YLL) and equivalent years of life lost due to disability (YLD)

Mean

The sum of all observations divided by the number of observations. Sometimes referred to as the 'average'.

Median

The middle observation in a distribution. Approximately 50% of the observations will be below the median and approximately 50% will be above the median.

Portion or serve

One portion or serve equals 75 grams of vegetables and 150 grams of fruit.

Relative risk

The relative risk estimates the magnitude of an association between exposure and disease and indicates the likelihood of developing the disease in the exposed group relative to those who are not exposed. A relative risk of 1.0 indicates that the incidence rates of disease in the exposed and non-exposed groups are identical and thus there is no association observed between the exposure and the disease. A value greater than 1.0 indicates a positive association, or an increased risk among those exposed to a factor. Thus, the relative risk of 1.4 would indicate that those exposed had 1.4 times the risk or were 40% more likely to develop the disease than those not exposed to the factor. A relative risk less than one means that there is an inverse association or decreased risk. A confidence interval around an estimate of a relative risk indicates the statistical significance of a result. A confidence interval that includes 1.0 is not statistically significant.

Relative standard error (RSE) = (SE/estimate) x 100

The relative standard error indicates the magnitude of the standard error, acting as a summary measure of the reliability of the sample estimates. It is calculated by dividing the standard error (SE) of the mean estimate by the mean estimate itself, and expressing the outcome as a percentage. The NSW Health Promotion Survey 1994 suggested the following interpretation of RSE:

- 16% or less be published without qualification.
- 16-33% be published with slight qualification, ie the estimate is not as reliable as other estimates in the data set, identified with.*
- 33-50% be published with substantial reservations, ie the estimate may be unreliable, identified with.**
- > 50% be suppressed as the estimate is unreliable, identified with.#

For the purposes of this report the RSE has been applied to the mean of AHS data obtained from the NSW Health Survey, and to data obtained from the 1995 NNS fruit and vegetable types.

SEIFA

Australian Bureau of Statistics defines SEIFA as socioeconomic index for areas. It includes an index of relative socioeconomic disadvantage (IRSD) which covers all areas of Australia and is based on 1996 Census data. Higher quintiles indicate higher socioeconomic status.

YLD

A measure of the burden of non-fatal health outcomes used in the construction of the DALY. YLD was originally the abbreviation for 'years lived with a disability'. It is more correctly understood as 'year equivalents lost to severity-adjusted disability'

YLL

Years of life lost. An indicator of the social burden of fatal health outcomes due to premature death.

NHMRC levels of evidence

Source: A guide to the development, implementation and evaluation of clinical practice guidelines NHMRC 1999

I Evidence obtained from a systematic review of all relevant randomised controlled trials.

II Evidence obtained from at least one properly designed randomised controlled trial.

III-1 Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).

III-2 Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case-control studies, or interrupted time series with a control group.

III-3 Evidence obtained from comparative studies with historical cohort, two or more single arm studies, or interrupted time series without a parallel control group.

IV Evidence obtained from case series, either post-test or pre-test/post-test.

There are very few Level I or Level II food-based nutrition trials. Most food health studies fall within Level III, the level of evidence which includes study designs such as cohort studies, case-control studies and comparative ecological studies with historical controls *(Appendix B, NHMRC Dietary Guidelines for Australians Draft 2001)*.

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Preface

The work of the NSW Centre for Public Health Nutrition

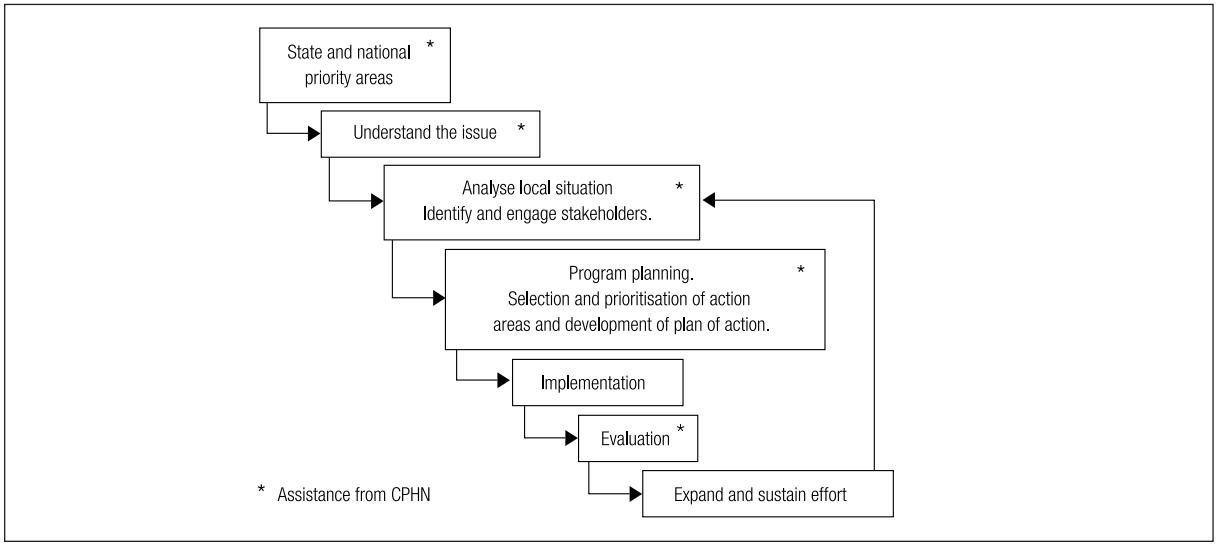
The NSW Centre for Public Health Nutrition (the Centre) was established in 2000 as an initiative of the NSW Department of Health in collaboration with the Sydney University Nutrition Research Foundation. It is located on campus at Sydney University. The Centre builds on previous work in planning a nutrition information system for NSW Health.

The Centre has a remit to review research findings regarding nutrition policy and programs and to produce authoritative documents and guidelines, which help steer nutrition interventions in NSW. It undertakes work in four main streams of action:

- evidence-based planning
- food and nutrition monitoring and surveillance
- public health workforce development
- applied research and evaluation.

It is not intended that the work of the NSW Centre for Public Health Nutrition replace or supersede the usual health promotion planning processes of the public health nutrition workforce in NSW. Most health agencies and units work through a detailed process for the development, implementation, evaluation and expansion of nutrition actions within their community or target group, similar to the process set out in Figure 1. The work program of the Centre is focussed upon producing reviews and analyses, which assist nutrition professionals to work through this process more efficiently and with a greater level of understanding and confidence. As such the reports from the Centre are tools to help guide and facilitate rather than dictate practice.

Figure 1. The health promotion planning process with reference to actions supported by CPHN work.



Source: Adapted from Hawe et al 1990.

Executive summary

Increasing vegetable and fruit consumption in the New South Wales population is a key public health priority.

There is little dispute that high vegetable and fruit consumption confers significant health benefits. Epidemiological evidence indicates that increasing intakes of vegetables and fruit decreases the risk of major chronic diseases including cancer, coronary heart disease, stroke, type 2 diabetes, diverticulitis, cataracts, macular degeneration, and chronic obstructive pulmonary disease. For optimal health benefits, the importance of consuming a variety of vegetables and fruit is stressed. It is also important that there appears to be a dose-response relationship between vegetable and fruit consumption and protection from ill health. Thus, important gains can be made by increasing consumption across all intake levels. It has been estimated, conservatively, that 3% of the total burden of disease in Australia is attributable to a low intake of vegetables and fruit. Expressed economically, the potential savings to the national health care system of increasing average vegetable consumption by only one serve per day is $24.4 million per year for colorectal, breast, lung, and prostate cancer alone.

Current consumption levels are well below those recommended, across all ages, for both sexes, and especially for some population sub-groups. Data from the 1995 National Nutrition Survey and the NSW Health Survey (1997/1998) indicate approximately 80% of men and women eat less than the recommended serves of five vegetables per day. Also, 50% of men and women eat one serve or less of fruit per day (the recommended intake is at least two serves per day for adults 19 years and over).

More than 80% of adolescents eat below recommended (less than four serves) amounts of vegetables, and about 40% eat below the recommended three serves of fruit per day. Younger children (aged 5-7) are more likely to consume recommended amounts of vegetables than children aged 8-11 years, but overall, few children consume the recommended amounts of vegetables and fruits per day.

Socioeconomically disadvantaged and indigenous women are more likely to have very low fruit intakes (less than one serve per day), as are both men and women in very remote areas.

Furthermore, the variety of vegetables, particularly, and fruit eaten, is limited. Potato is the predominant vegetable consumed, contributing from one third to one half, depending on age, of total vegetable consumption. Tomato products are the next most commonly consumed vegetable type. A limited variety and quantity of other vegetables (such as leafy greens, cruciferous, orange and dark green vegetables) is consumed, yet it is these nutrient-dense vegetables that are likely to offer most health protection.

Apples and pears are the most commonly consumed fruits, contributing up to 30% of all fruit eaten by adults, and up to 45% by young children. Tropical fruits (including bananas) are the next most commonly consumed fruit.

So why aren't people eating enough vegetables and fruit? Attitudes and lack of knowledge are key barriers to increased consumption of vegetables and fruit. These include:

- erroneous individual self-perceptions that they are consuming enough vegetables and fruit
- lack of knowledge and under-estimation of how much constitutes 'a serve'
- lack of knowledge of ways to change habitual consumption without undue cost and inconvenience.

Notably, the emphasis on long-term health benefits is less motivational for younger, healthy people than learning about short-term health and lifestyle benefits.

Additional substantial barriers to high vegetable and fruit consumption relate to their supply and access in terms of availability, appeal (including quality), convenience and affordability.

Current information (using data from the National Nutrition Survey 1995 and the 1997/1998 NSW Health Survey) about vegetable and fruit intake is reasonably comprehensive. However, some gaps in knowledge need to be addressed in order to provide comprehensive information for strategic planning and decision-making. The latter section of this report focuses on providing recommendations for improved monitoring related to vegetable and fruit consumption in NSW.

The need for practical methods for collecting more detailed information about the variety of fruit and, particularly, vegetables consumed, is highlighted. A first suggestion is to include a special module on vegetable and fruit consumption in the NSW Health Surveys.

More comprehensive information on access and supply (cost, variety, availability, quality) of vegetables and fruit in NSW is needed. Valid and standardised methods for collection are needed so that data from different areas can be compared. Various approaches, such as market basket surveys, have been used successfully in several states and selected local communities. These could serve as the basis for a nationally standardised approach to monitoring aspects of supply and access to vegetables and fruit. More information on sales of vegetables and fruit could be gained through liaison with industry to adopt methods such as scanning at point of purchase.

As knowledge and attitudes in the population shift, monitoring (both qualitative and quantitative) will assist in tracking behavioural determinants of vegetable and fruit consumption, particularly among those population sub-groups most at risk of low levels of consumption. Also, information gained from monitoring will guide intervention methods and messages.

Many of the data presented concerning cost savings – primarily to the health care system due to reduced illness – from increased vegetable and fruit consumption are from national and international studies. Thus economic analyses specific to NSW would be beneficial for policy makers.

In conclusion, this report highlights the importance of increased consumption levels of a variety of vegetables and fruit at all levels of intake across NSW. It highlights those groups with the lowest intakes and who are hence at greatest risk of the many major chronic diseases linked to low consumption. Therefore it provides the health system and key stakeholders with considerable evidence to justify investment in this priority area at various levels to achieve long-term positive health outcomes and economic benefits.

1 Introduction

1.1 Context of this report

Promoting an increased intake of vegetables and fruit is a public health nutrition priority area under NSW Health's *Eat Well NSW: Strategic Directions for Public Health Nutrition 2003-2007* (NSW Department of Health 2003). *Eat Well NSW* was developed as a statement of strategic directions for public health nutrition in NSW to guide and facilitate measurable population food and nutrition improvements in NSW. The statement provides:

- directions for integrating food and nutrition into public health policies and programs in NSW
- a guide to modifying or re-orienting current public health nutrition policies, strategies and programs
- priorities for new work and new investment in public health nutrition programs
- guiding principles for selecting public health approaches to improve nutrition
- a basis for advocacy with non-health sectors about the impact of their policies and programs on food and nutrition issues.

Eat Well NSW priorities are directly relevant to the main issues of a number of important NSW public health policies and strategies, particularly *Healthy People 2005* and the *Draft NSW Health and Equity Statement*.

This report on the consumption of vegetables and fruit in NSW has been produced by the NSW Centre for Public Health Nutrition as part of the support material required to address the priority issues identified in *Eat Well NSW*. It assembles information to indicate the size of the problem of low intakes of vegetables and fruit in NSW, the health and economic consequences of low intakes, and recommendations for intakes. It also details barriers to and factors affecting low levels of consumption.

The report provides an argument for the need to invest resources and stimulate action to promote increased intakes of vegetables and fruit in NSW across both health and private sectors. The report also helps identify key target groups, ie those most at risk of low intakes of vegetables and fruit, as well as key behaviours and features of the environment, which need to be considered in planning for this action.

1.2 Purpose of this report

This report provides the rationale for including *promoting increased intakes of vegetables and fruit* among the NSW population as a priority issue under *Eat Well NSW* and to support public health stakeholders who are attempting to effect this increase in consumption.

It reviews the current data and information available on the recommended and actual intakes of vegetables and fruit in NSW and the factors most likely to contribute to the problem of low intakes. This report aims to:

- identify key indicators of the intake of vegetables and fruit in the NSW population from currently available sources of data
- identify gaps in the availability or quality of data available for key indicators of intakes
- provide an overview of the current consumption of vegetables and fruit in the NSW population based on the key indicators of intakes per day, food habits, health consequences, and behavioural and environmental factors contributing to low level intakes
- demonstrate how monitoring intake of vegetables and fruit is an important element in the planning and evaluation of interventions to address the problem.

This report reviews the information currently available about the extent of the problem throughout NSW and the factors that are most likely to contribute to the problem and/or to provide potential action areas to address the problem.

This report does not make recommendations about how to promote increased intakes of vegetables and fruit in NSW. Separate reviews of interventions have already been done by the National Public Health Partnership (Miller 2000) and this intervention portfolio comprehensively details the process of developing programs to promote consumption of vegetables and fruit.

There are seven sections to this monitoring report. Section Two presents the latest evidence available on the known health benefits attributed to the consumption of vegetables (including legumes) and fruit. Section Three describes, the burden of disease associated with low-level intakes. Section Four outlines, current

vegetable and fruit consumption recommendations from key authoritative organisations worldwide. Next, the extent of the problem in NSW is detailed and those groups of individuals who are at risk of lower intakes are identified. Section Six discusses the key barriers to consumption, and Section Seven lists recommendations for monitoring.

1.3 Who has this report been written for?

This report has been written to meet the needs of various organisations and workers, including:

a Area Health Service personnel, including public health and community nutritionists, community and clinical dietitians, Area planners, and Area health promotion personnel.

The range of health and disease problems and subsequent health care costs detailed in this report can be used as a rationale for investment in this priority issue.

The detailed information on consumption of vegetables and fruit in various areas of NSW will provide a baseline measure for future monitoring and evaluation of interventions. Health workers will be able to identify sub-groups with low intakes in their community, and hence provide information for targeting interventions.

The consumer behavioural and attitudinal barriers to increased consumption, as well as the food security issues which contribute to the problem, are indicated and will inform planning and decision making.

b NSW Department of Health
This report should be useful to the Centre for Health Promotion within the NSW Department of Health as a basis for the development of future strategies to address issues associated with the monitoring and promotion of the consumption of vegetables and fruit, and hence the prevention of illness associated with low intakes.

It provides an overview of the NSW population's current consumption of vegetables and fruit, and highlights the health and financial costs to NSW due to low intakes. This is useful background material for *Eat Well NSW*, but it also provides justification for addressing this issue in other program areas within NSW Health. It also supports the need for ongoing monitoring of vegetable and fruit consumption. Recommendations on how this can be carried out in future health surveys are detailed.

c Other potential suppliers and users of nutrition information, include researchers and public health academics, government and non-government organisations and private sector groups that are stakeholders in addressing the issues associated with consumption of vegetables and fruit.

It is important that all organisations that have a stakeholder role in promoting the consumption of vegetables and fruit for both health and commercial outcomes, have access to information that clearly identifies the nature and size of the problem and identifies areas in which they have potential influence. It is intended that this report be used to raise the awareness of stakeholders and to gain their support for multi-sectoral action to address the problem. In addition, the report could help identify areas where these organisations have a direct influence on those factors underlying low levels of consumption in the community.

1.4 A conceptual framework for identifying relevant monitoring information

The framework outlined in Figure 2 has been used to guide the identification and presentation of relevant data and information for this monitoring report. It is based on the conceptual framework developed by the Australian Food and Nutrition Monitoring Unit, to guide the selection and development of national public health nutrition indicators and the presentation of information relevant to these (Marks et al 2001). The framework is discussed in more detail in a special report from the NSW Centre for Public Health Nutrition titled *MS-1: Data sources for food and nutrition monitoring in NSW; guidelines for preparing 'special issue' monitoring reports* (Webb and Gill, 2001).

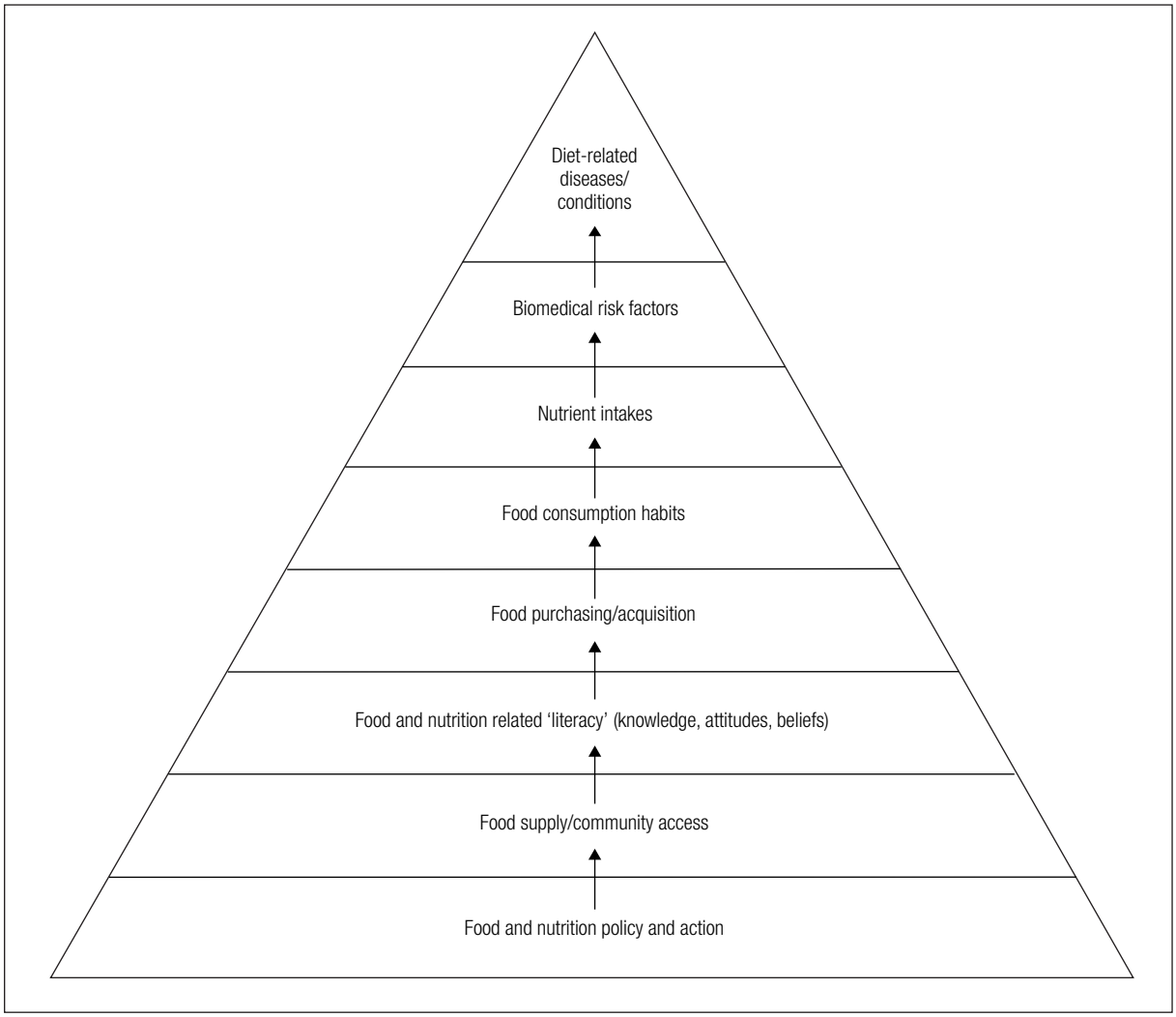
Usually, the lower levels of the hierarchy relate to action by the health and nutrition sectors, while mid-levels relate to intermediate outcomes, such as consumer literacy, knowledge, attitudes, actions, and habits. Upper levels relate to biomedical and health outcomes of the intended beneficiaries of the policy or program. This report has focussed on the middle levels of the hierarchy in an attempt to document the size of the problem and the key

factors contributing to and preventing the consumption of vegetables and fruit in NSW. These are outlined in Sections 5 and 6 of this report. However, local health workers are advised to collect information about the key determinants at the lower levels of the hierarchy, within their own communities.

The information used within this report is not exhaustive but was selected on the following basis, that it:

- is representative of NSW where possible. However, relevant Australian or international data are presented where specific NSW information is not available or easily accessible
- is Area Health Service specific, where representative population data is available
- is in the public domain and comes from a reputable source
- comes from large-scale or high quality surveys that are routinely collected to allow continued monitoring over time
- is based on valid, standardised and consistent measurement methods.

Figure 2. A conceptual framework for monitoring vegetable and fruit consumption



2 Health rationale for the promotion of increased consumption of vegetables and fruit

2.1 Health risks associated with low consumption of vegetables and fruit

A major problem of nutritional epidemiology, which makes it stand apart from other attempts to contrast the health/disease outcomes of 'exposed' and 'unexposed' populations, is that there is invariably no absolute 'unexposed' category with which to compare the 'exposed' populations. In other words, it is difficult to prove a causal relationship between dietary exposure and disease. The issues surrounding this problem are discussed in detail in *The relationship between the consumption of fruits and vegetables and health status* (Baghurst et al 1999).

Nevertheless, considerable epidemiological and clinical evidence supports the protective effect of vegetables and fruit for a number of chronic diseases, in particular many cancers and coronary heart disease. These two diseases were responsible for 20% and 16% of deaths in males and 17% and 6% of deaths in females respectively in NSW in 1998 (Chief Health Officer's Report 2000).

Evidence (categorised by NHMRC as Level II and Level III evidence) is accumulating for protection against a range of other diseases including stroke, type 2 diabetes, chronic obstructive pulmonary diseases, cataracts, diverticulosis, and possibly hypertension (Van Duyn and Pivonka 2000; Rimm et al 1996; Block et al 1992; Steinmetz and Potter 1996; Ness and Powles 1997).

Whilst there are other food types/groups that can also contribute to reduction in the incidence of disease (for example, consuming a diet low in saturated fats reduces the risk of coronary heart disease) there is no other group of foods that is protective against such a wide range of illnesses (other than perhaps breast milk in infants).

Indeed, the World Cancer Research Fund, together with the American Institute for Cancer Research, conducted a major review of the link between 18 cancers and diet (Food, Nutrition and the Prevention of Cancer: A Global Perspective WCRF/AICR 1997). The conclusion in their report was:

> *'Evidence of dietary protection against cancer is strongest and most consistent for diets high in vegetables and fruits… Other aspects of diet probably or possibly modify the risk of cancers of various sites.'*

Table 1 is a summary of the current strength of evidence (from most to least convincing) supporting the protection that vegetables and fruit offer against major chronic diseases, as reported by 5+ A Day, New Zealand (www.5aday.co.nz 2002).

Table 1. Summary of the evaluation of evidence of associations between vegetable and fruit consumption and selected diseases

Disease	Strength of evidence	Assessment of evidence
Neural tube birth defects	Substantial, proven	Proven
Cancer - number of sites	Substantial, growing	Extremely convincing
Cardiovascular disease	Substantial, growing	Very convincing
Diverticulosis	Strong	Convincing
Cataracts/ Macular disease	Growing	Convincing
Type 2 diabetes	Mixed, indirect	Convincing
Stroke	Limited, building	Becoming convincing
Hypertension	Limited	Suggestive
COPD	New	Suggestive
Overweight and obesity	Sparse, indirect	Convincing as part of treatment/ prevention

Source: 5+A Day New Zealand

Cancer

Scientific and general publications abound with statements such as:

> *'There is a strong and consistent pattern showing that diets high in vegetables and fruit decrease the risk of many cancers, and perhaps cancers in general.'*

Source: Increasing vegetable and fruit consumption in British Columbia (Dufresne and Milne 2001)

Such statements are the result of many studies culminating in a number of recent reviews. One large review (247 studies to 1996) was conducted jointly by the World Cancer Research Fund and the American Institute for Cancer Research (WCRF/AICR1997, also mentioned above). A summary of this review is reported in Table 2.

Clearly, the consumption of vegetables in particular, and fruit, provide a protective effect against a large number of cancers.

Table 2. Strength of evidence related to the protective effect of vegetable and fruit consumption to various cancers (WCRF/AICR 1997)

Cancer site	Vegetables and/ or Fruit	Evidence
Mouth and pharynx Oesophagus Lung Stomach	Vegetables and fruit	Convincing
Colon Rectum	Vegetables	
Larynx Pancreas Breast Bladder	Vegetables and fruit	Probable
Cervix Ovary Endometrium Thyroid	Vegetables and fruit	Possible
Liver Prostate Kidney	Vegetables	

Source: Adapted from Dufresne and Milne, 2001 – Increasing Fruit and Vegetable Consumption in British Columbia

The European prospective investigation into cancer and nutrition, *EPIC*, (Riboli 2001) also indicates that there is strong evidence supporting a reduced risk of cancers of the mouth, pharynx and oesophagus, with an increase in vegetable and fruit consumption. A review by the UK Committee of Medical Aspects of Food and Nutrition Policy (COMA 1998) found a stronger association with reduced risk of prostate cancer than indicated in Table 2.

Since these reviews, further studies have indicated reduced risks of cancers of the oral cavity, stomach, colon and rectum, lung, bladder, breast and prostate. These studies are listed in the current Australian Dietary Guidelines document (NHMRC 2002), which summarises epidemiological evidence of the need to eat more vegetables and fruit.

Cardiovascular disease (coronary heart disease and stroke)

Available evidence indicates a strong association between vegetable and fruit consumption and prevention of coronary heart disease (Ness and Powles 1997; van't Veer et al 2000; Law 1998). A review (12 studies since 1994) by Klerk et al (1998) suggested a reduction in risk of coronary heart disease of 20-40%.

Other studies suggest a protective role for fruits and vegetables against cardiovascular disease, of which coronary heart disease is one sub category (Gaziano et al 1995, Ginter 1995). The review (250 observational studies) by van't Veer et al (2000) suggests cardiovascular deaths could be reduced by up to 22% (or approximately 8000 deaths annually in the Netherlands) by increasing vegetable and fruit consumption.

Diets low in the vitamin folate, found in green, leafy vegetables, have been associated with elevated total blood homocysteine, a factor associated with increased incidence of cardiovascular disease (Selhub et al 1993; Jacques et al 1999; Selhub et al 1999). One study has estimated that around 10% of all cardiovascular disease may be attributable to moderately elevated total homocysteine levels (Boushey et al 1995).

The benefits of legume consumption are also worthy of note. Bazzano et al (2001) concluded that:

> *'… an increased legume intake may be an important part of a dietary approach for the primary prevention of coronary heart disease in the general population'.*

Recent studies (a review of 14) indicate a protective role of fruit, and, particularly, vegetables, against the incidence of stroke, with a reduction in incidence of up to 25% (Ness and Powles 1997).

Relative risks of disease associated with low vegetable and fruit consumption

The relative risk of a person who consumes inadequate daily amounts of vegetables and fruit (according to AIHW), getting cancer or cardiovascular disease, compared to a person who does consume recommended amounts, is shown in Table 3.

Table 3. Relative risks associated with inadequate (< 5 servings of vegetables and fruit combined) vegetables and fruit consumption

Age group	All Cancers	Ischaemic heart disease	Stroke
25-44	1.4	1.18	1.14
45-64	1.3	1.18	1.13
65-74	1.2	1.11	1.1
75 and over	1.1	1.00	1.05

Source: New Zealand Ministry of Health (NZMOH): Our Health, Our Future, The Health of New Zealanders (1999)

This table shows that people consuming below recommended amounts (according to the AIHW) of vegetables and fruit have an increased risk of suffering from cancer (all cancers), ischaemic heart disease, and stroke. For example, a person aged 25-44 years who does not eat five or more serves of vegetables and fruit (combined) per day has approximately 1.4 times the risk of developing cancer compared to a person who does eat the recommended number of serves per day.

These relative risk estimates were adjusted for confounders, and hence represent the independent effect of inadequate vegetable and fruit consumption. The NZMOH argues, therefore, that the estimates provided are conservative ones, leading to a possible underestimation of the derived attributable fractions (NZMOH 1999).

Hypertension

Definitive links between vegetable and fruit consumption and hypertension are not evident. However, there are indications from research studies (eg Appel 2000) that a diet high in vegetables and fruit can contribute to a reduction in hypertension, particularly when combined with a low fat diet (eg DASH – Dietary Approaches to Stop Hypertension).

Neural tube defects

Clinical trials have proven that folic acid (a water soluble B vitamin present in leafy greens, asparagus, cruciferous vegetables, peas, orange juice and legumes) can prevent neural tube defects such as spina bifida. Scientific experts now estimate that half of all neural tube defects could be prevented by women consuming the recommended intake of folic acid shortly before conception and in early pregnancy. Vegetables and fruit that contain folic acid, along with fortified grain products and oral supplements, can play a vital role in meeting folic acid recommendations (Firth et al 1998).

Diverticulosis

Evidence suggests that insoluble fibre, primarily the cell wall polysaccharides of fruit, vegetables and legumes, has a large protective role in the prevention of diverticulosis and constipation (Aldoori et al 1998).

Cataracts and age-related macular degeneration

Recent studies have shown that the consumption of vegetables, in particular those containing lutein (eg spinach), is associated with a reduction in the number of cataracts requiring surgery (Brown et al 1998; Chasen-Taber et al 1999). These studies were preceded by others that indicated a protective effect of vegetables and fruits for cataract development (Jacques and Chylack 1991; Hankinson et al 1992; Mares-Perlman et al 1995). Also, consumption of carotenoid-rich vegetables and fruits (Table 4) has been shown to reduce the risk of developing macular degeneration, particularly in smokers (Snodderly et al 1995).

Diabetes – type 2

There is evidence for both direct and indirect effects of increased vegetable and fruit consumption and a reduction in the incidence of diabetes.

A recent study conducted in Britain found that people who regularly ate salad and raw vegetables all year-round had an 80% lower risk of developing type 2 diabetes than people who ate vegetables less often, even after adjusting for confounding factors (Williams et al 1999).

Also, as detailed below, increased consumption of vegetables and fruit can lead to a reduction in obesity (by displacement of energy-dense foods). Thus, as obesity

is implicated as a major risk factor in the etiology of diabetes (Eriksson and Lindgarde 1991; Pfohl and Schatz 2001), it is likely that an increase in vegetable and fruit consumption could indirectly result in a reduction in the incidence of type 2 diabetes.

Respiratory illness

A diet high in fruit may protect against respiratory illness. Recent research in the UK showed a significant increase in lung function and reduced wheeze in both children and adults when their diets were high in fruit, particularly apples and tomatoes (Lewis 2001). This study also found that eating 1.5 pieces of fruit or a large tablespoonful of vegetables every day can protect against emphysema and chronic bronchitis in smokers (Watson 2001). Other studies have indicated a greater role of vegetables in the reduction of chronic obstructive pulmonary disease (COPD) (eg La Vecchia et al 1998).

Watson's study is particularly interesting as it showed that no other food groups, such as fish and dairy, or proteins, fats or snack items, were significantly protective. Thus, this study provides good evidence of the importance of vegetable and fruit consumption in particular.

There is also increasing evidence that increased fruit intake will reduce asthma and wheeze in children (Forestiere et al 2000).

Overweight and obesity

As yet, there is no evidence of a direct causal association between a high intake of vegetables and fruit and maintenance of a healthy weight. However, increased consumption of vegetables and fruit may help displace snack foods and other energy dense foods that are high in fat and sugar from the diet. A high intake of these energy-dense foods is known to contribute to passive over-consumption and therefore may be a factor in the development of overweight and obesity (WHO 2000).

The prevention of weight gain and maintenance of a healthy weight, which could potentially be mediated by higher intakes of vegetables and fruit, would also contribute to a reduction in other chronic diseases in which obesity is a major risk factor. These include type 2 diabetes, coronary heart disease, and hypertension (discussed above).

2.2 How does vegetables and fruit consumption reduce chronic disease?

The old adage was 'vegetables and fruit are full of fibre and vitamins'. Extensive research has uncovered the knowledge that vegetables and fruit contain a variety of more than 100 known compounds, including a range of phytochemicals (chemicals that occur naturally in plants such as fruits and vegetables) such as the antioxidants vitamins C and E, carotenoids, flavenoids, minerals and folate. Antioxidants in particular are identified as playing a large role in protecting against many of the chronic diseases listed – notably several types of cancer and CVD (including stroke).

Other examples are:

Flavenoids	protective against stroke and COPD
Soluble fibre	protective against heart disease and diabetes
Folate	protective against neural tube defects; colorectal and other cancers; and heart disease

Notably, it appears that the protection is afforded through a range of compounds working together rather than a single compound in isolation. Hence the greatest protection against disease comes from consumption of the *whole* vegetable or fruit, as opposed to individual nutrient supplements.

This is supported by the results of clinical trials of supplements that have not successfully replicated the clear positive effects of consumption of the actual vegetables and fruits. In some cases the supplements have even been shown to be detrimental (eg Redlich et al 1999).

A selection of the key nutrients, together with examples of vegetables and fruits in which they are found, and their protective effects, are summarised in Table 4. The range of protective compounds and the vegetables and fruits in which they occur, highlights the importance of eating a *variety* of vegetables and fruits to ensure maximum protective effect.

The two factors of consumption – the consumption of whole vegetables and fruits, and consumption of a variety of vegetables and fruit per day – are key considerations for monitoring and intervention planning.

2.3 Vegetable and fruit consumption levels for protective effects – 'the more the better'

Quantity

The exact quantity and variety of vegetables and fruit required for maximum protection from disease is not clear. Many studies have found that increasing vegetable and fruit consumption by just small amounts can protect against some diseases. For example, Watson (2001) showed that eating just 1.5 pieces of fruit or a large tablespoonful of vegetables every day can protect against COPD (emphysema and chronic bronchitis). However, whilst consumption of any vegetable and fruits is likely to be of some benefit against *some* diseases, the research evidence indicates an inverse relationship between quantity and variety consumed and reduction in health risks (eg Gandini et al 2000, for breast cancer). Thus, higher intakes (particularly of vegetables) provide greater protective effects; and lower intakes, in terms of below recommended levels and lack of variety, are associated with increased risk of disease (Block 1992; Dittus 1995; Walker 1996). In other words, there is a dose-response – *the more the better*.

EPIC studies support the dose-response relationship and also indicate that *significant health gains can be made from even a small increase in vegetable or fruit consumption*. An increased intake of vitamin C from fruit or vegetables equivalent to an extra 50 grams per day could cut the risk of premature death from any cause by 20%. Adding two more daily portions of vegetables and fruit could reduce the risk by up to half (One portion or serve equals 75 grams of vegetables and 150 grams of fruit). These findings hold true regardless of a person's age, blood pressure or whether they smoke (Khaw et al 2001).

A dose-response was shown convincingly in several examples in the WCRF 1997 report. For example, for lung cancer, there was a halving of the relative risk as intakes increased from 150 to 400 g per day (ie from about two to about five servings per day, assuming a 75 grams serve). Similar dose-response relations were noted for stomach cancer for both vegetables and fruit. Because the upper limit of the dose-response range that can be evaluated is limited by the ranges of intakes in the populations studied, few data exist to support specific, quantitative recommendations for intakes of vegetables or fruit above 350 or 400 grams per day (see Section 4).

Table 4. Key compounds in vegetables and fruit, their food sources, and protective effects

Nutrient	Vegetable and fruit sources*	Protective effects
Vitamins and minerals		
Folate	Leafy greens, asparagus, cruciferous vegetables (broccoli, cabbage, cauliflower, and brussel sprouts), peas, orange juice, legumes	Cancer, inadequate intake may lead to chromosomal damage at specific sites, eg colorectal cancer Reduces neural tube defects Reduces levels of homocysteine, protects against heart disease
Vitamin C	Citrus, kiwifruit, capsicum, cruciferous vegetables	Cancer. Antioxidant. Reduces nitrites reducing formation of nitrosamines, a carcinogen
Potassium	Most vegetables & fruit	Possible in prevention or control of hypertension and subsequent risk of stroke and heart disease
Carotenoids		
Alpha Carotene	Carrots	Antioxidant inhibits cell production
Beta-carotene	Orange/yellow-coloured vegetables and fruit, eg pumpkin, sweet potato, melon, mango, apricot	Antioxidant, inhibits cell production
Lutein	Green vegetables, spinach, silverbeet, peas, asparagus	Antioxidant, protects against cataracts and macular degeneration
Lycopene	Tomatoes (particularly cooked), red capsicum, watermelon	Antioxidant, may reduce risk of prostate cancer Decreases LDL cholesterol oxidation
Zeaxanthin	Citrus, corn	Antioxidant, protects against cataracts and macular degeneration
Anthocyanins	Cherries, strawberries, blueberries, blackcurrants	Antioxidants Inhibit LDL cholesterol oxidation Inhibit platelet aggregation
Flavenoids	Most vegetables and fruit and legumes, especially in skin	Antioxidants May reduce cell proliferation Anti-inflammatory action Boosts action of vitamin C
Glucosinolates/ Indoles	Cruciferous vegetables, leafy greens	Protect against oestrogen-promoted cancers
Phytoestrogens		
Isoflavones	Soy beans	Protect against breast cancer
Lignans	Vegetables	Antioxidants, lower LDL, total cholesterol and triglycerides
Saponins	Legumes – soy bean, kidney bean, lentils	May lower LDL cholesterol and anti cancer enzymes
Sulfides [allium]	Onions, garlic, leeks, cruciferous vegetables	Stimulate anti cancer enzymes, detoxify carcinogens and antibacterial activity
Fibre		
Insoluble	Vegetables, fruit and legumes	Protects against diverticulosis and constipation
Soluble	Vegetables and fruit	Binds and dilutes carcinogenic substances, assists control of blood sugar and cholesterol levels

Source: adapted from Dufrense and Milne 2001

**Only a selection of vegetables and fruit are indicated – the list is not exhaustive*

Exposure period

High consumption of vegetables and fruit should begin in childhood. The arguments for this are twofold. First, food preferences and habits are formed in childhood and tend to be maintained into adulthood (Westenhoefer 2001, Krebs-Smith 1996). Second, there is evidence of a latent protective effect, with consumption of recommended intakes of vegetables and fruit in childhood reducing the risk of disease in later life. For example, in one study of ovarian cancer, women who reported consuming at least 2.5 servings of vegetables and fruit daily as adolescents were 46% less likely to develop ovarian cancer later in life (Fairfield et al 2001). This finding indicates that the pertinent exposure period may be much earlier than formerly anticipated. Indeed, for some diseases, eg breast cancer (Smith-Warner et al 2001), there is no clear evidence of an association between adult intake of vegetables and fruit and disease risk. However, it may well be that childhood and adolescent consumption, in addition to or regardless of adult intake, is linked significantly in these instances.

The current Australian Dietary Guidelines (2003) indicate that:

> *'… establishment of good eating practices at an early age is recommended to avoid development of expression of [chronic diseases] in later life'.*

The Australian Dietary Guidelines for Children and Adolescents (2003) also state:

> *'It is acknowledged that it is uncommon for many of the chronic diseases discussed in this section [on vegetable and fruit consumption] to express themselves in childhood and/or adolescence, although the precursors and risk factors for many of these can be identified from an early age.'*

3 Burden of disease attributable to low consumption of vegetables and fruit in NSW and Australia

There are unique problems involved in determining the cost of illness – in terms of burden of disease (how many illnesses and deaths) and consequently the health care and social costs – attributable to diet. This is because of the problems inherent in assessing diet-disease relationships and in analysing dietary data (Marks et al 2001). The previous section of this report indicated that the most convincing evidence of a protective role of vegetables and fruit consumption is in cancers and cardiovascular diseases. It also contained some indication of the relative risk of inadequate vegetable and fruit consumption (Table 1). The idea of relative risks and subsequent health costs is explored further in this section of the report.

3.1 Premature mortality

The major diseases for which there is strong evidence that high consumption of a range of vegetables and fruit protects against – cardiovascular disease and cancer – are the major causes of mortality burden in Australia (Table 5).

Also, the table shows that those cancers for which there is convincing evidence (WCRF/AICR 1997) of a protective effect of vegetable and fruit consumption (lung and colorectal cancers, are among the top 10 causes of mortality burden). Similarly, those cancers for which there is probable (breast) and possible (prostate and ovary) evidence are among these major health burdens.

Section 2 indicated that one study in particular had shown that high consumption of vegetables was associated with a reduced risk of COPD – again, this is one of the major health burdens in terms of mortality in Australia (Table 5).

Mortality burden (YLL) data specific to NSW were not available for this report. However, the major diseases for which there is strong evidence that consumption of a high amount and range of vegetables and fruit protects against, specifically cancers and cardiovascular diseases, are known to be the major causes of death in NSW (Figure 3).

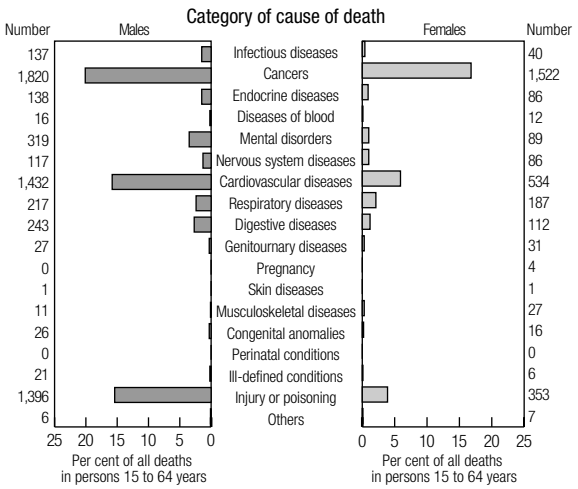
Table 5. Mortality burden: percentage of total years of life lost due to mortality (YLL), by sex, in Australia in 1996

Persons (1 348 233 YLL)	% of Total	Males (752 591 YLL)	% of Total	Females (595 642 YLL)	% of Total
Ischaemic heart disease	20.5	Ischaemic heart disease	21.0	Ischaemic heart disease	19.7
Stroke	8.3	Lung cancer	7.3	Stroke	9.5
Lung cancer	6.3	Suicide	5.9	Breast cancer	6.8
Suicide	5.2	Stroke	5.6	Lung cancer	4.7
Colorectal cancer	4.4	Road traffic accidents	4.5	Colorectal cancer	4.4
COPD	4.0	COPD	4.2	COPD	3.9
Road traffic accidents	3.3	Colorectal cancer	3.9	Dementia	2.6
Breast cancer	2.8	Prostate cancer	3.0	Diabetes mellitus	2.5
Diabetes mellitus*	2.1	Diabetes mellitus	2.1	Road traffic accidents	2.1
Dementia	1.8	Cirrhosis	1.7	Ovarian cancer	2.0

Source: Mathers et al 2000

** Includes type 1 and type 2 diabetes*

Figure 3. Deaths by category of cause and sex for persons aged 15-64 years, NSW 1998



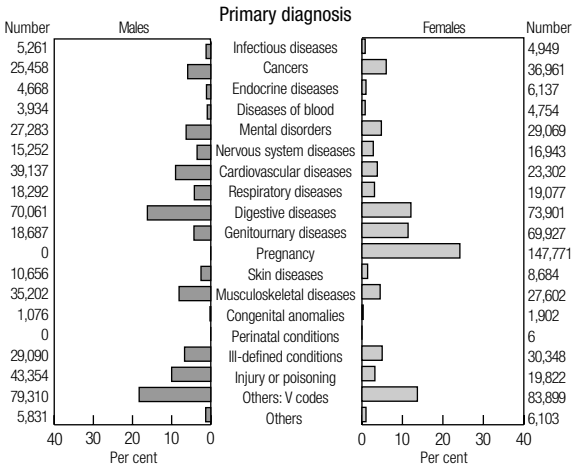
Source: The Health of the People NSW – Report of the Chief Health Officer 2000, p 70

In New Zealand it has been estimated that if everyone in the population ate five or more servings of vegetables and fruit (combined) per day, premature mortality would be reduced by over 800 deaths per year – for the population of 3.8 million (NZMOH 1999). Thus, for NSW, which has a population of 6.3 million, increased vegetable and fruit consumption to these levels would result in a reduction of at least 1300 premature deaths per year. Increased consumption to Australian (AGHE) recommended levels (five vegetables and two fruit) would result in an even greater reduction in premature mortality.

3.2 Morbidity

One of the primary groups of morbidity associated with low consumption of vegetables and fruit is, as for mortality, cardiovascular disease (CVD) – primarily ischaemic heart disease and stroke. In 1995, 21% of the adult Australian population was living with these diseases, and in 1996 CVD accounted for 22% of the disease burden in Australia (AIHW 2000). It is unlikely that the situation in NSW is vastly different from that nationally.

Figure 4. Principal diagnosis for hospitalisation by sex, persons aged 15-64 years, NSW 1998



Source: The health of the People of NSW – Report of the Chief Health Officer 2000, p 79

Cardiovascular disease ranks amongst the highest causes for hospitalisation in NSW and Australia (Figure 4). Another leading cause of hospitalisation is digestive diseases. Lack of vegetable and fruit consumption can contribute to diverticulosis and constipation, thus contributing to the morbidity burden of NSW.

3.3 Total burden of disease associated with low levels of consumption

The Australian Burden of Disease and Injury Study, undertaken by the Australian Institute of Health and Welfare (AIHW 1999; Mathers et al 2000), provides an assessment of the amount of ill health and disability – the 'burden of disease' – in Australia. Burden of disease was measured using the disability-adjusted life year (DALY), which takes into account the impact of disability and other non-fatal health outcomes (YLD), as well as the impact of premature death (YLL). One of the factors studied was vegetable and fruit consumption, specifically 'inadequate' consumption. Inadequate consumption of vegetables and fruit was defined in this study as less than five serves of vegetables or fruit (combined) per day.

Mathers et al (2000) indicated that inadequate consumption of vegetable and fruits accounts for around 3% of the total burden of disease, compared to 2% from alcohol and 10% from tobacco. The Burden of Disease Study used the relative risks between diet and disease indicated in Table 6 to determine attributable fractions, and thus burden of disease.

Table 6. The burden of disease attributable to inadequate vegetable and fruit consumption, Australia, 1995

	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	2,541	3.7	1,516	2.5	4,057	3.2
YLL	33,082	4.4	22,881	3.8	55,963	4.2
YLD	7,044	1.2	5,071	0.9	12,114	1.0
DALYs	40,126	3.0	27,951	2.4	98,077	2.7

Source: AIHW Burden of Disease 1999 (Mathers et al 2000)

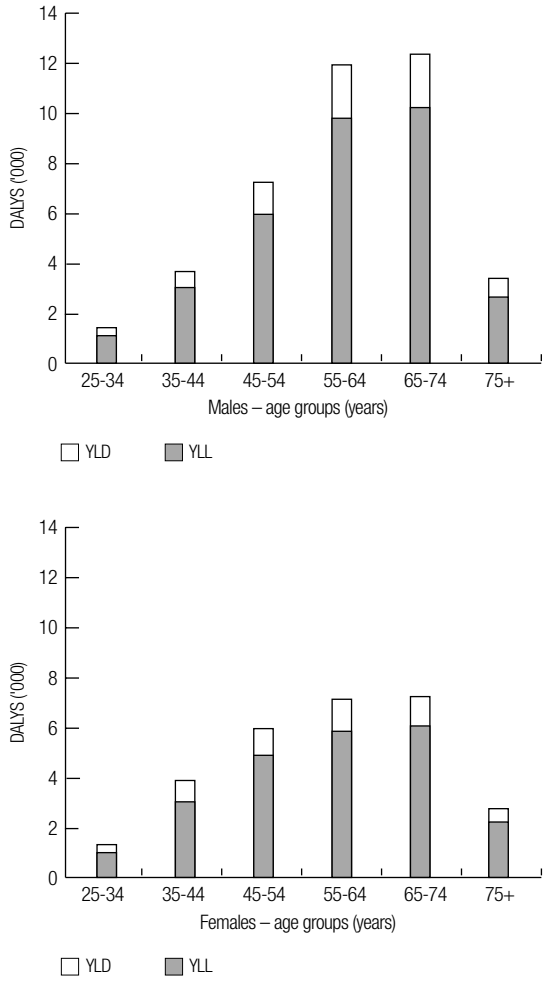
The AIHW Burden of Disease Study (1999) attributes approximately 11% of all cancers, which relates to 3,000 deaths or 51,000 DALYs, to inadequate vegetable and fruit consumption. Inadequate consumption of vegetables and fruit also results in 700 deaths or 12,000 DALYs due to ischaemic heart disease and 180 deaths or 4,000 DALYs due to stroke.

These findings are comparable to those from studies by the New Zealand and Canadian health ministries (NZMOH 1999; Dufresne and Milne 2001).

It is notable that the burden of disease would be even higher than indicated in Table 6 if 'inadequate' consumption reflected 'actual' consumption or if the 'inadequate' referred to less than the AGHE's recommended '5+2' serves per day. The majority of the population is consuming far fewer amounts of vegetable and fruit than the 'inadequate' amounts used in the AIHW study.

The overall attributable burden is higher for men than women at all ages and is highest for men, particularly, and women between the ages of 55 and 74 (Figure 5).

Figure 5. YLL and YLD attributable to inadequate vegetable and fruit consumption, by age and sex, Australia 1996



Source: The Burden of Disease and Injury in Australia, AIHW 1999, p 13

3.4 Economic costs attributable to low consumption of vegetables and fruit in Australia

Cancer

The most recent study in Australia was carried out by the AFNMU as part of the National Food and Nutrition Monitoring and Surveillance Project, funded by the Commonwealth Department of Health and Aged Care (Marks et al 2001 *Cancer costs in Australia – the potential impact of dietary change*).

This study cited the findings of the WCRF and COMA reviews of diet and cancer, and considered that there was a protective effect of vegetables for colorectal, breast, lung, and prostate cancer; and a protective effect of fruit for breast and lung cancers. Over 320 studies of diet and cancer were reviewed and, together with the findings of the WCRF and COMA reviews, they used meta analyses to derive pooled relative risks for the relationships between vegetable and fruit consumption levels and these four cancers.

Marks et al (2001) estimated that low vegetable consumption (< 4 serves per day) accounted for 17% of the risk of colorectal cancer, 2% of the risk for breast cancer, and 9% of the risk for both lung and prostate cancer in Australia. Also, low fruit consumption (< 3 serves per day) accounted for 21% of the risk for lung cancer and 4% of the risk for breast cancer.

The population attributable fraction (PAF) for each cancer/diet relationship was then applied to health care costs as reported by the AIHW for 1993-4. Thus, the following costs are likely to be about 10% greater for 2001. Treatment costs for colorectal cancer alone were estimated to be $146.6 million in Australia in 1993-4 and direct costs were estimated to be $205 million (Mathers et al 1998).

The study concluded that:

- Total health care costs associated with low consumption of vegetables for four cancers only – colorectal, breast, lung and prostate – were estimated to be $58.8 million per year
- Total health care costs associated with low consumption of fruit for breast and lung cancer was estimated as $29.4 million per year.

These estimates are only for direct health system costs and do not include indirect and intangible costs. The AFNMU concluded that diets with low intakes of vegetable and fruit contribute substantially to direct health system costs (hospitals, drugs, medical personnel, research etc.) associated with cancers.

It was estimated that increasing the average vegetable consumption by one serve per day has the potential of saving the national health care system $24.4 million per year for costs associated with colorectal, breast, lung and prostate cancer (Marks et al 2001). This saving could increase to $43.7 million if the average intake of vegetables increased by two servings per day. Also, the potential savings to the health care system of increasing average fruit consumption by one or two extra serves per day is $6.2 and $20.8 million per year, respectively.

To highlight an international example: a study in British Columbia, Canada, which has a population of 3.6 million, estimated that the cost of cancer attributable to inadequate intakes of vegetables and fruit was $328 million 1993 AUD equivalent (Dufresne and Milne 2001).

Cardiovascular disease

The health and economic costs of cardiovascular disease are greater than for any other disease (ABS, Australian Social Trends 2002). In 1993-94 this was equivalent to $3.7 billion, or 12% of total health costs. Thus, if 3% of the burden of cardiovascular disease is attributable to low vegetable and fruit consumption, then this equates to $111 million in health care costs.

Baghurst et al (1999) produced a report, *The relationship between the consumption of fruits and vegetables and health status* for the Department of Health and Aged Care and the Strategic Intergovernmental Nutrition Alliance (SIGNAL). They were reluctant to estimate the potential economic savings due to increased vegetable and fruit consumption. However, they made a 'broad brush' estimate that $200 million per year could be saved on costs for cancer incidence and cardiovascular mortality due to increased vegetable and fruit consumption.

In summary, the Burden of Disease study, and other studies reviewed, suggest that large health and economic gains could be expected from effective public health campaigns addressing the underlying causes of low levels of consumption of vegetables and fruit. The gains indicated here are due only to certain cancers and cardiovascular disease. With increasing evidence of the link between low vegetable and fruit consumption and many other diseases (Section 2) the potential gains are obviously much higher.

4 Consumption recommendations by authoritative organisations

In many of the early dietary guidelines, vegetables and fruit were combined with other plant foods (grains) and their recommended consumption was often included in a general statement concerning overall health and good diet and related to recommended dietary intakes (NHMRC 1991). Increasingly, dietary guidelines are more specific about the types of vegetables and fruit that should be eaten and how often, and these recommendations are based primarily on particular health benefits shown by epidemiological studies.

4.1 Current Australian dietary guidelines for vegetable and fruit consumption

The Dietary Guidelines for Australians (NHMRC 1992), and the Dietary Guidelines for Children and Adolescents (NHMRC 1995) plus review documents (2001)

Following are some extracts from the background papers of the previously published Dietary Guidelines for Australians (DGA) and Dietary Guidelines for Children and Adolescents (DGCA):

> *'These guidelines are a distillation of dietary advice from health professionals to the general public. They represent the best consensus of scientific knowledge and public health advice currently available. The guidelines are based upon current scientific knowledge about the relationships between diet and disease, nutrients available in the Australian food supply, and the profile of morbidity and mortality in Australia.*
>
> *Overwhelming evidence now exists for the public health benefits of diets high in plant foods. Recent evidence suggests that significant protective effects in relation to a number of cancer sites and cardiovascular diseases, including stroke, are obtained in populations with higher intakes of vegetables and fruits.'*
>
> *(Dietary Guidelines for Australians NHMRC 1998)*

The broad guideline for intake of vegetables and fruit in both sets of guidelines is:

> *'Eat plenty of breads and cereals (preferably whole grain), vegetables (including legumes) and fruit'.*

Both sets of guidelines have recently been reviewed and include increasing epidemiological evidence of the many health benefits of vegetable and fruit consumption. Thus, the present guidelines differ from the previous in that separate guidelines have been established for breads and cereals, and for vegetables (including legumes) and fruits. The reasoning behind this change is:

> *'… it is felt that the health benefits conferred by these two categories of plant foods tend to often occur by largely different mechanisms and the dietary components involved are distributed differently between cereal grains and fruits and vegetables.'*
>
> *(Dietary Guidelines for Australians NHMRC 2003)*

The guidelines for children and adolescents note that the establishment of good eating habits at an early age is recommended to avoid development or expression of chronic conditions in later life.

The current Dietary Guidelines for Adults, and those for Children and Adolescents, refer to the core food group analysis recommendation endorsed by the NHMRC (1995) that indicated a minimum daily consumption of five serves of vegetables and two serves of fruit. It should be noted that potatoes and legumes are included in these Australian guidelines. Consumption of a variety of vegetables in particular is stressed. Both sets of guidelines also refer to the *Australian Guide to Healthy Eating*, detailed below.

Australian Guide to Healthy Eating

The *Australian Guide to Healthy Eating* (AGHE), released in 1998, is based on food intakes and health problems of the population as a whole. It is based on widely accepted scientific principles and has been informed by the previous DGA and DGCA and the Recommended Dietary Intakes for use in Australia. It was developed as part of the National Food And Nutrition Policy (Department of Health and Aged Care 1992) and offers a detailed, practical approach to consumption of vegetables and fruits.

It differs from the NHMRC Five Core Food Groups (1992) in that vegetables are separated from fruits due to their differing nutrient profiles. Potatoes and legumes are again included with vegetables. This separation of vegetables and fruit from other plant foods and from each other is now included in the reviewed Australian Dietary Guidelines, as indicated above.

The AGHE provides recommendations for the number of serves of vegetables (including legumes) and fruit to be consumed per day for different age groups:

Children (4-7 years)	at least 2 and up to 4 serves of vegetables
	at least 1 serve and up to 2 serves of fruit
Children (8-11 years)	at least 3 and up to 5 serves of vegetables
	at least 1 and up to 2 serves of fruit
Adolescents (12-18 years)	at least 4 and up to 9 serves of vegetables
	at least 3 and up to 4 serves of fruit
Adults (19-60 years)	at least 4 and up to 8 serves of vegetables
	at least 2 and up to 4 serves of fruit
Adults (60+)	at least 4 and up to 7 serves of vegetables
	at least 2 and up to 3 serves of fruit

(Note: There are no recommendations for children under 4 years)

The definition of what constitutes a serve of vegetables (including legumes) and fruit, according to the AGHE, is summarised in Table 7.

Table 7. Sample serves in the Australian Guide to Healthy Eating (1998)

Vegetables: 1 serve equals	Fruit: 1 serve equals
75 grams or ½ cup cooked vegetables	1 medium piece (150g) eg banana, apple, orange, pear
75 grams or ½ cup cooked legumes, dried peas, beans, lentils	2 small pieces (150g) eg apricots, kiwifruit, plums
1 cup salad vegetables	1 cup diced pieces or canned fruit
1 small potato	½ cup (125 ml) fruit juice
	Dried fruit eg 4 dried apricot halves, 1½ tablespoons sultanas

The AGHE recommends consumption of a wide variety of vegetables (including legumes) and fruit every day, eg green leafy vegetables, red and yellow vegetables and fruits high in vitamin C and beta-carotene, and includes both cooked and raw foods.

Dietary Guidelines for Older Australians (NHMRC 1999)
These guidelines are based on the Dietary Guidelines for Australians and take into account the nutritional needs that occur with ageing. Similarly to the DGA, these guidelines are designed for use with the NHMRC publication *Recommended Dietary Intakes for use in Australia*.

The specific recommendation for vegetables and fruits is:

> *'Eat plenty of vegetables (including legumes) and fruit'.*

As in the revised DGA and DGCA documents, vegetables and fruit are separated from breads and cereals. More specific recommendations in the body of the guide relate to NHMRC recommendations for all Australians, ie to eat a variety of plant foods in an amount equivalent to about seven servings each day (five of vegetables, two of fruit). The guidelines indicate that serving sizes for older Australians need to be reduced (for example, by half a cup to a quarter) if energy expenditure is lower.

The guidelines note the importance of adequate intake of some of the less widely distributed dietary components, hence the need to deliberately select certain vegetables and fruits, eg green leafy vegetables for folate and yellow and orange fruits and vegetables for carotenoids.

Inclusion of potatoes and fruit juice

The AGHE, for example, emphasises that the vegetables and fruit consumed can be from a variety of sources, ie fresh, frozen, canned or dried. It also includes potatoes as part of the vegetable recommendations. Whether or not to include potatoes in the number of serves of vegetables is a contentious issue, mainly because potatoes represent the largest percentage of vegetables consumed in Australia and this is often as hot chips (certainly in adolescents). The popularity of chips and french fries is of concern as potatoes are not as rich in phytochemicals as many other vegetables, and their methods of preparation make them very fatty (Dietary Guidelines for Children and Adolescents, 2003). The World Cancer

Research Fund (WCRF) excludes potatoes from their list of recommendations for vegetable consumption. Their recommendation, based on epidemiological evidence of the relationship between vegetable and fruit consumption and cancer only, is to eat 400-500 grams or five servings or more a day of a variety of vegetables and fruits, all year round. Pulses (legumes) and starchy vegetables and fruits (tubers, starchy roots and plantains) are not included. (WCRF 1997).

A similarly contentious issue is the question of whether to include fruit juice in dietary guidelines. Fruit juice is included in the serving suggestions of the AGHE, but other guides exclude fruit juice as part of the recommended serves of fruit. The high intake of fruit juice (or fruit juice drink) contributes to a high consumption of sugar, and is likely to displace the consumption of other 'healthier' beverages such as water and milk. Additionally, the consumption of fruit juice in place of whole fruit, lowers the intake of fibre and is associated with an increased risk of dental caries. There is also confusion by the public as to what constitutes fruit juice. A common misconception is that cordial and fruit juice drinks represent pure fruit juice when they often contain added sugar.

Strategic Inter-Governmental Nutrition Alliance/ Eat Well Australia 2000-2010

Promoting vegetable and fruit consumption is one of the key health gain priorities in the *Eat Well Australia* national strategy launched in 2001, and one of the first to be actioned. The strategy is based on the NHMRC recommended intake of at least five serves of vegetables and two serves of fruit per day (SIGNAL 2001).

Dietitians Association of Australia (DAA)

The DAA recommends consumption of at least seven serves of vegetables and fruit per day: at least two serves of fruit and at least five serves of vegetables (DAA Media Background Statement on Fruits and Vegetables 29 September 2000). This recommendation is based on the Australian Guide to Healthy Eating. The DAA encourages consumption of a variety of vegetables and fruit, including fresh, canned, frozen, juice and dried forms.

4.2 International guidelines and policy

World Health Organization

The World Health Organization study group on Diet, Nutrition and the Prevention of Chronic Diseases (WHO, 1990) recommended the daily consumption of at least 400 grams (14 oz) of vegetables and fruit, including at least 30 grams (1 oz) of pulses, nuts, and seeds. This was followed up in 1991 with the same recommendations (WHO, 1991), based primarily on evidence of the reduced risk of cancer.

Committee on Medical Aspects of Food and Nutrition Policy (COMA), UK

In 1994 COMA reviewed the evidence of the protective effect of vegetables and fruit against heart disease. Their subsequent review in 1998 of the reduced risk of some cancers through consumption of vegetables and fruit led to the recommendation that consumption should be at least five portions (about 400 grams) per day (note: potatoes were included in the portions). The UK National Health Service Plan states that consuming at least five serves of vegetables and fruit every day could lead to an estimated reduction of up to 20% in overall deaths from chronic diseases such as heart disease, stroke and cancer (UK Department of Health 2000).

World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR)

In 1997 the WCRF and the AICR, in recognition of the role of vegetables and fruit in reducing the risk of cancer, recommended the daily consumption of 400-800 grams of a variety of vegetables and fruit. This excluded legumes and potatoes (see above). As did the UK organisations, these two organisations concluded that intakes of more than 400 grams per day could prevent at least 20% of all cancers. They estimated that increased intakes of vegetables and fruit to five per day, combined with increased physical activity, could lead to a reduction in world cancer rates by 30-40%.

United States Department of Agriculture (USDA): Dietary Guidelines for Americans 2000 and Food Guide Pyramid

The USDA's food guide pyramid recommendations are two-fold:

1 choose a variety of fruits and vegetables daily

2 eat at least two servings of fruit and at least three servings of vegetables each day.

Thus the USA national 5-A-Day campaign was launched in the late 1980s to increase consumption of vegetables and fruit. This was an industry-led campaign, recommending the consumption of at least five servings of fruits and vegetables in total per day (excluding potatoes). Recommendations were not based on intakes required for maximum protective health benefits, but rather on population intakes from the 1970s. Recommendations also considered behaviour theory, or 'convenience for consumers'. The message 'consume five serves per day' was considered to be easy to remember and not too hard to attain (Foerster 1995; Miller 1997).

The American Heart Association

The American Heart Association's dietary guideline recommendations are:

> *'Eat a variety of fruits and vegetables. Choose five or more servings per day.'*

The American Heart Association's dietary guidelines state:

> *'Healthy food habits can help you reduce three of the major risk factors for heart attack – high blood cholesterol, high blood pressure, and excess body weight. They'll also help reduce your risk of stroke, because heart disease and high blood pressure are major risk factors for stroke.'*

Health Canada: Food Guide

The Food Guide for Canada recommends consumption of at least five to ten serves of vegetables and fruit per day. The '5-to-10 A Day: Are You Getting Enough?' campaign, implemented by Canadian Produce Marketing Association, Canadian Cancer Society and Heart and Stroke Foundation, is based on this recommendation. This food guide acknowledges that different people need different amounts. One specific recommendation of the guide is:

> *'Choose dark green and orange vegetables and orange fruit more often'.*

The list above is by no means exhaustive. In summary, the vast majority of guidelines and recommendations indicate the need for consumption of a variety of vegetables and fruit of different colours and types; and the need for at least five servings (400 grams) of vegetables and fruit per day for adults. Australian recommendations, particularly those of the AGHE (ie two serves of fruit and five serves of vegetables), tend to be higher than those for many other countries.

5 Current consumption of vegetables and fruit in NSW

The main surveys that have assessed the consumption of vegetables and fruit amongst people in NSW in the last decade are:

- *National Nutrition Survey 1995 (NNS 1995)* – A joint publication between the ABS and the Department of Health and Aged Care Services. National Nutrition Survey: Foods Eaten, Australia, 1995 (4804.0) www.abs.gov.au.
- *NSW Health Surveys (NSW HS 1997 and 1998)* – Public Health Division. Report on the 1997 and 1998 NSW Health Surveys. NSW Department of Health, 2000. www.health.nsw.gov.au/public-health/nswhs/hsindex.htm.
- *Australian Secondary Student Alcohol and Drug Survey (ASSAD 1996 and 1999)* – Schofield et al. Self-reported behaviours of NSW secondary school students – Sun protection, physical activity, eating patterns and injury. *The Australian School Students' Alcohol and Drug Survey, 1996*. Sydney: NSW Cancer Council and NSW Department of Health, 1998.

  Schofield et al. Self-reported behaviours of NSW secondary school students – Sun protection, physical activity, eating patterns and injury. *The Australian School Students' Alcohol and Drug Survey, 1999*. Sydney: NSW Cancer Council and NSW Department of Health, 2002.
- *Older People's Health Survey (1999)* – Public Health Division. NSW Older People's Health Survey 1999. Sydney, NSW Department of Health, 2000. www.health.nsw.gov.au/public-health/ophs99.
- *Child Health Survey (2001)* – Centre for Epidemiology and Research, NSW Department of Health, New South Wales Child Health Survey 2001. NSW Public Health Bulletin 2002: 13;S-4. www.health.nsw.gov.au/public-health/phb/phb.html.

Details of each of these surveys are contained in Appendix 1A and survey questions relating to vegetables and fruit consumption are included in Appendix 1B.

5.1 Adult consumption levels

Amounts of vegetables and fruit consumed

The NNS asked participants (n=2881 for NSW, aged 2 years and over) about foods eaten in the previous 24 hours. These data have been used to describe the total amount of foods consumed and food types. Additionally, participants completed short questions about their usual intake of vegetables and fruit. The same short questions were used in the NSW HS (1997 and 1998, n=35 025), however in this survey responses were not pre-grouped.

These short questions provide data that give a reasonably good indication of vegetable and fruit intake. The validity of these questions was good when compared to 24-hour recalls from the NNS. Reported intakes of vegetables and fruit corresponded well with measured intakes ($p<0.001$, Rutishauser 2001).

A disadvantage of the NNS questionnaire is the pre-grouping of the response categories. This limits the use of the information and its comparability to other surveys. However, in this report the data from the NSW HS have also been grouped, so that comparisons can be made.

Table 8 summarises 24-hour recall data for NSW from the NNS 1995.

Table 8. Proportion of adults consuming any vegetables and fruit in NSW in 24hr recall by age and gender, National Nutrition Survey 1995 NSW sub-sample

Food Type	Age groups (Years)	Male %	Female %
Vegetables	19-24	87.1	91.2
	25-44	87.8	89.2
	45-64	92.9	90.2
	65-74	92.2	93.5
	75 +	93.1	93.3
Fruit	19-24	31.9	47.2
	25-44	47.4	54.9
	45-64	57.7	70.1
	65-74	66.4	71.9
	75 +	67.6	79.2

Source: National Nutrition Survey 1995; NSW tables 1998

- Less than one third of men aged 19-24 years and less than half the women aged 19-24 years consumed any fruit in the 24-hour recall period.
- Men of all ages consume less fruit than women.
- The proportion of men and women consuming fruit increased with age. Almost 80% of women aged 75 years and over consumed fruit.
- Most people, about 90% of adults, consumed some vegetables. As with fruit, consumption rates increased with age.

Adult consumption rates determined using the short questions in the 1995 NNS and the 1997/1998 NSW Health Surveys are summarised in Tables 9 and 10.

Table 9. Usual consumption of vegetables by adults, male and female, as determined in two surveys: National Nutrition Survey 1995* (19+ years) and NSW Health Survey 1997/1998** (18+ years)

	Males %		Females %	
	NNS	NSW HS	NNS	NSW HS
≤ 1 serve	28.5	42.4	22.1	31.2
2-3 serves	57.3	40.7	56.6	47.6
≥ 4 serves	13.3	16.9	22.2	21.2

** Source: ABS, supplementary table produced for the NSW Department of Health 2000*

*** Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001*

Table 10. Usual consumption of fruit by adults, male and female, as determined in two surveys: National Nutrition Survey 1995 (19+ years) and NSW Health Survey 1997/1998 (18+ years)

	Males %		Females %	
	NNS	NSW HS	NNS	NSW HS
≤ 1 serve	57.6	60.5	43.0	48.4
2-3 serves	35.4	32.2	49.3	44.7
≥ 4 serves	6.3	7.3	7.5	7.0

- 86% of men and 79% of women in NSW consumed less than four serves of vegetables per day, as determined in the 1995 NNS.
- Fewer men and women reported consuming four serves or more of vegetables in the 1997/1998 Health Survey than in the 1995 NNS. However, more men and women reported consuming at least one serve of vegetables in the latter survey.
- Both surveys showed similar amounts of fruit consumption in adults. About 60% of men and about 45% of women consumed one serve or less of fruit per day.
- Interestingly, many more women than men reported consuming 2-3 serves per day. The same small numbers of men and women consumed 4 or more serves per day.

Vegetable and fruit consumption by adult men and women in the Area Health Services

Data derived from the short questions in the NSW HS 1997/1998, of vegetable and fruit intakes in both men and women for the various Area Health Services (AHS) in NSW are summarised in Tables 11 and 12, respectively. These data are stratified by sex but not age.

It is valuable to consider the mean and median intake of the population in order to provide a snapshot of intake; hence these values are indicated in the tables. 'Mean intake' is the straightforward 'average intake'. 'Median intake' refers to the number of servings consumed by 50% of the population.

Those AHS with significantly higher or lower mean intakes than NSW as a whole are indicated (↑, ↓). The relative standard error of the mean (see glossary) for the state and each AHS was less than 5% for all Areas, indicating that the mean of each AHS is reliable.

- Males and females from South West Sydney and Central Sydney had the lowest intake of vegetables, with mean intake significantly lower than mean intake for NSW overall.
- In some Areas, significantly more men and women consumed higher amounts of vegetables (as indicated by the higher means than NSW overall). These were:
  - Far West, Hunter, Illawarra, Mid North Coast and Northern Rivers.
- The median intake for both males and females was less than or half the recommended intake of five serves of vegetables per day in most Areas (ie median ranged from 2.0-2.5).
- In all AHS men consume less fruit than women.
- The median intake for all males was less than the recommended minimum serves of two fruit per day, ie at least 50% of all males consume less than the recommended intake. In contrast, the median number of serves consumed by women in several of the AHS was 2.0.
- Northern Rivers and the Mid North Coast had notably higher than state average (mean) intakes of fruit.
- Those consuming very low fruit intakes (less than one serve per day) ranged from 37% amongst males in the Far West to 10% amongst females in Northern Sydney.

Table 11. Number of serves of vegetables usually consumed by adult men and women for each NSW Area Health Service, NSW Health Survey 1997/1998

	% Consuming by number of serves						Number of serves	
Area Health Service	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**5+**	**Mean[1]**	**Median**
Male								
Central Coast	7	37	29	11	8	7	2.1	2.0
Central Sydney	14	32	30	10	7	6	2.0 ↓	2.0
Far West	7	24	28	13	11	17	2.9 ↑	2.0
Greater Murray	7	38	28	9	11	7	2.1	2.0
Hunter	9	31	25	13	10	12	2.5 ↑	2.0
Illawarra	6	32	26	12	10	13	2.5 ↑	2.0
Macquarie	5	36	27	14	13	5	2.2	2.0
Mid North Coast	4	29	30	14	12	11	2.5 ↑	2.0
Mid Western	5	36	31	13	8	6	2.1 ↓	2.0
New England	5	35	29	12	10	8	2.2	2.0
Northern Rivers	5	30	28	15	11	11	2.6 ↑	2.0
Northern Sydney	8	34	31	14	8	5	2.1	2.0
Sth East Sydney	7	34	30	14	8	8	2.2	2.0
Sth West Sydney	9	40	28	9	8	5	2.0 ↓	2.0
Southern	8	35	26	13	11	7	2.2	2.0
Wentworth	9	37	26	13	9	6	2.1 ↓	2.0
Western Sydney	10	35	28	10	10	8	2.2	2.0
All NSW	8	34	28	12	9	8	2.2	2.0
Female								
Central Coast	4	26	32	18	11	8	2.4 ↓	2.0
Central Sydney	8	30	31	15	10	6	2.2 ↓	2.0
Far West	5	21	24	18	12	19	3.0 ↑	2.5
Greater Murray	5	26	30	19	12	8	2.4	2.0
Hunter	5	23	27	18	15	12	2.7 ↑	2.0
Illawarra	4	22	25	22	15	13	2.8 ↑	2.5
Macquarie	3	24	29	20	13	10	2.6 ↑	2.0
Mid North Coast	3	20	26	21	15	14	2.9 ↑	2.5
Mid Western	4	28	29	19	12	8	2.4	2.0
New England	4	24	27	19	16	10	2.6 ↑	2.0
Northern Rivers	4	22	28	20	15	11	2.7 ↑	2.0
Northern Sydney	3	25	32	18	12	9	2.7	2.0
Sth East Sydney	6	24	31	18	12	9	2.5	2.0
Sth West Sydney	7	32	30	17	8	6	2.2 ↓	2.0
Southern	3	25	30	21	13	8	2.5	2.0
Wentworth	6	26	28	19	10	9	2.4	2.0
Western Sydney	6	28	28	17	11	10	2.4	2.0
All NSW	5	26	29	18	12	9	2.5	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001

1 Relative standard error (RSE) of mean all <5%.

↓ mean of AHS significantly lower than mean for NSW (p<0.05)

↑ mean of AHS significantly greater than mean for NSW (p<0.05)

Table 12. Number of serves of fruit usually consumed by adult men and women for each NSW Area Health Service, NSW Health Survey 1997/1998

	% Consuming by number of serves					Number of serves	
Area Health Service	**<1**	**1<2**	**2<3**	**3<4**	**4+**	**Mean[1]**	**Median**
Male							
Central Coast	29	34	22	8	7	1.4	1.0
Central Sydney	26	34	21	10	8	1.7	1.0
Far West	37	30	16	11	6	1.4 ↓	1.0
Greater Murray	30	36	22	7	5	1.3 ↓	1.0
Hunter	28	32	23	9	7	1.6	1.0
Illawarra	29	30	23	10	9	1.6	1.0
Macquarie	34	33	22	7	5	1.3 ↓	1.0
Mid North Coast	21	36	23	10	10	1.7 ↑	1.0
Mid Western	27	37	23	8	5	1.4 ↓	1.0
New England	29	37	17	9	7	1.4 ↓	1.0
Northern Rivers	21	32	26	13	9	1.8 ↑	1.0
Northern Sydney	25	35	23	9	7	1.5	1.0
Sth East Sydney	20	39	22	11	8	1.7	1.0
Sth West Sydney	26	35	24	10	6	1.5	1.0
Southern	28	37	20	8	6	1.4 ↓	1.0
Wentworth	27	37	20	9	6	1.4	1.0
Western Sydney	28	33	21	9	8	1.6	1.0
All NSW	25	35	22	10	7	1.6	1.0
Female							
Central Coast	17	31	29	16	7	1.7	2.0
Central Sydney	16	32	28	18	6	1.8	2.0
Far West	20	35	23	13	9	1.7	1.0
Greater Murray	17	36	28	14	5	1.6 ↓	1.0
Hunter	21	34	28	12	6	1.6 ↓	1.0
Illawarra	17	28	31	17	7	1.8	2.0
Macquarie	20	33	26	14	7	1.7	1.0
Mid North Coast	13	28	30	19	10	2.0 ↑	2.0
Mid Western	18	34	29	13	6	1.7 ↓	1.0
New England	18	35	26	13	7	1.7 ↓	1.0
Northern Rivers	15	27	29	18	10	2.0 ↑	2.0
Northern Sydney	10	33	30	18	8	1.9 ↑	2.0
Sth East Sydney	14	32	31	17	6	1.8	2.0
Sth West Sydney	19	32	27	16	6	1.7 ↓	1.0
Southern	17	33	28	16	6	1.7	2.0
Wentworth	19	31	28	14	8	1.7	1.5
Western Sydney	16	35	27	16	6	1.7	1.5
All NSW	16	33	29	16	7	1.8	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001

1 relative standard error (RSE) of mean all <5%.

↓ mean of AHS significantly lower than mean for NSW (p<0.05)

↑ mean of AHS significantly greater than mean for NSW (p<0.05)

Varieties of vegetables and fruit consumed by adults

Consumption of a variety of vegetables and fruits, particularly vegetables, is necessary to ensure adequate ingestion of a wide range of phytochemicals, ie factors that offer protective effects against many chronic diseases.

Data on food and beverage consumption reported in 24-hour recalls from the 1995 National Nutrition Survey (NNS) were categorised into varying levels of detail. Vegetables and fruits were classified into the sub-major food groups listed below. All forms of vegetables and fruit (fresh, canned, dried, salad, and cooked, except fruit or vegetable juices), were included. Examples of the types of foods included in each group are listed below.

Vegetable products and dishes:

- potatoes – cooked potato, hot potato chips, mashed potato, potato salad
- brassica vegetables – cabbage, cauliflower, broccoli
- carrot and root vegetables – carrot, beetroot, parsnip, radish, sweet potato
- leaf and stalk vegetables – lettuce, spinach, bean sprouts
- peas and beans - green beans, peas, snow peas
- tomato and tomato products – raw tomato, tomato paste
- other fruiting vegetables – pumpkin, zucchini, avocado, cucumber, eggplant
- other vegetable combinations – corn, mushrooms, garlic, onion, mixed vegetables, coleslaw.

Legumes (eg baked beans, kidney beans, chickpeas, lentils and tofu) were classified separately and were not included in the total vegetable component.

Fruit products:

- pomme fruit – fresh pears and apples, canned apples
- berry fruit – blackberry, blueberry, strawberry
- citrus fruit – orange, canned grapefruit, lemon peel
- stone fruit – apricot, cherry, peach, plum
- tropical fruit – banana, pineapple, mango, pawpaw
- other fruit – melons, grapes, dates, passionfruit
- dried fruit – sultanas, banana chip, dried peach.

Fruit juices were not included in the fruit varieties.

Detailed tables summarising the variety of vegetables and fruit eaten on a 'per consumer' basis, for different adult (19+ years) age groups in NSW, are contained in Appendix 2A (Tables 1-4). The percentages of different vegetable and fruit types consumed by people in NSW (expressed on a per-consumer basis) are indicated in the pie charts below (Figures 6-9).

Figure 6. Percentage of people in NSW consuming different types of vegetables

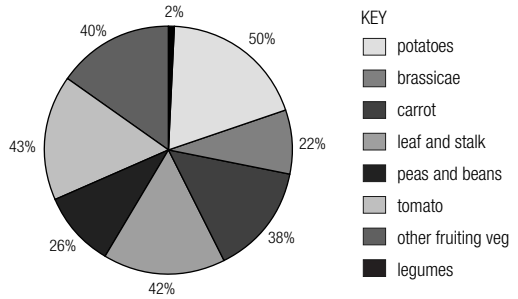
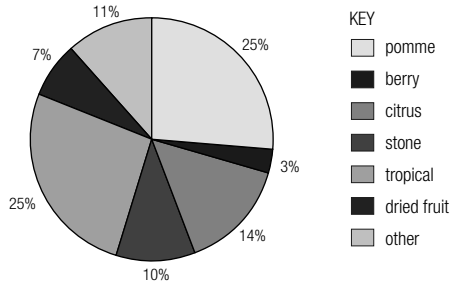


Figure 7. Percentage of people in NSW consuming different types of fruit



This data indicates that potatoes and tomatoes were the most commonly consumed vegetables, with around half of all NSW respondents reporting consuming potatoes, and 43% consuming tomatoes in the previous 24 hours. Leaf and stalk vegetables and carrots were the next most commonly consumed vegetables, whilst less than 2% of NSW adults indicated that they had consumed legumes on the previous day. The most commonly consumed fruits were tropical fruits and pomme (possibly apples and bananas), with 25% of NSW respondents reporting consuming these during the previous day. Stone fruit and citrus were less popular in NSW and only around 3% of respondents reported consuming berry fruits.

The data shown in Figures 6 and 7 are for women and men in NSW combined. Data were not available on varieties consumed by the different sexes for NSW, hence data from the NNS 1995 (Foods eaten in Australia) are shown below, for Australia, for men and women. It should be noted that the Australian data are presented on a per capita basis, that is, the amount of different types of vegetables and fruit consumed per adult in Australia.

Figure 8. Amount of different types of vegetables consumed by females, aged 19 years and over, in Australia (per capita, NNS 1995)

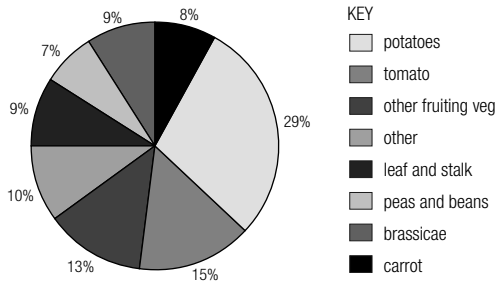


Figure 9. Amount of different types of vegetables consumed by males, aged 19 years and over, in Australia (per capita, NNS 1995)

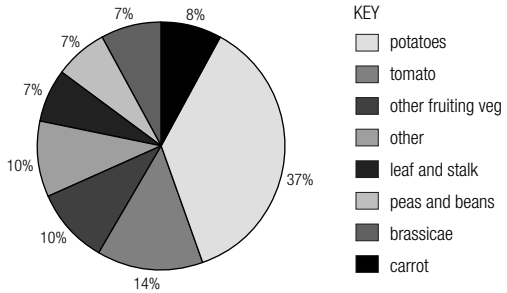


Figure 10. Amount of different types of fruit consumed by females, aged 19 years and over, in Australia (per capita, NNS 1995)

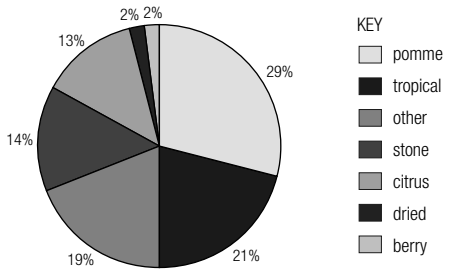
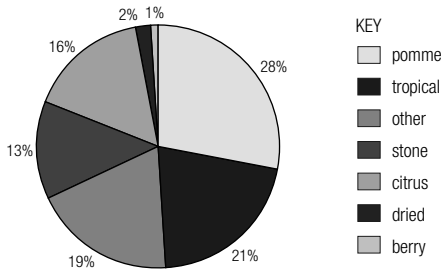


Figure 11. Amount of different types of fruit consumed by males, aged 19 years and over, in Australia (per capita, NNS 1995)



These data show that among Australian adults who consume vegetables, men consume much more potato, whilst women tend to eat less potato and more of a wider range of vegetables. Fruit consumption appears to vary very little between the sexes.

Table 13 presents data collected by Roy Morgan Research in which approximately 2,600 people participated in a telephone survey (in 2000) about consumption of types of vegetables and fruit (Coles 2000). Different categories were used in the Coles survey to the NNS. Potatoes, apples and bananas are reported as the main vegetable and fruit types consumed, which is consistent with the data presented from the NNS. Carrots were much more popular in this survey than for the population as a whole.

Table 13. The ten most popular types of vegetables and fruit reported by the Coles vegetable and fruit Index (2000)

Fresh fruit	%	Vegetables	%
Apple	52	Potato	47
Banana	51	Carrot	41
Orange	19	Broccoli	25
Mango	8	Tomato	17
Strawberry	7	Pumpkin	15
Pear	7	Beans	14
Kiwi fruit	5	Peas	14
Watermelon	5	Lettuce	14
Rockmelon	4	Cauliflower	13
Peach	4	Onion	11

Source: Coles Supermarkets Roy Morgan Research, commissioned by Coles Supermarkets Australia. Coles vegetable and fruit Index. 1998, 1999 and 2000

5.2 Children and adolescents' consumption levels

Amounts of vegetables and fruit consumed

NNS, NSW sub-sample, 1995 (adolescents)

Information about vegetable and fruit consumption for 12-18 year olds, as measured by short questions in the 1995 NNS, NSW sub-sample, is presented in Tables 14 and 15. The short questions pertaining to vegetable and fruit consumption have shown reasonable validity when compared to 24-hour recall of vegetable and fruit intake for adults. However, the validity of the short questions has not been assessed among adolescents.

The AGHE recommends adolescents aged 12-18 years consume at least four serves of vegetables and at least three serves of fruit per day.

- The amount of vegetables consumed was similar for both male and female adolescents.
- About 85% of both boys and girls aged 12-18 years did not consume the recommended amounts of vegetables (four serves or more per day).
- More boys than girls aged 12-18 years consumed the recommended three serves (although the category was 2-3 serves) of fruit per day.
- 34% of male and 54% of female adolescents ate one serve or less of fruit per day.

Table 14. Number of serves of vegetables usually consumed by male and female adolescents (12-19 years), National Nutrition Survey 1995: NSW sub-sample

	Boys (%)	Girls (%)
1 serve or less*	30	36
2-3 serves	55	48
4-5 serves	10	15
≥ 6 serves	1	0.5

Source: ABS, Supplementary table produced for the NSW Department of Health

** includes those who do not eat vegetables*

Table 15. Number of serves of fruit usually consumed by male and female adolescents (12-19 years), National Nutrition Survey 1995: NSW sub-sample

	Boys (%)	Girls (%)
1 serve or less*	34	54
2-3 serves	47	34
≥ 4 serves	17	12

Source: ABS, Supplementary table produced for the NSW Department of Health

** includes those who do not eat fruit*

Australian School Students' Alcohol and Drugs Survey, 1996 and 1999 (Adolescents)

The data presented in Tables 16 and 17 are from the NSW component of a national study of students from secondary schools. This study, conducted during 1996 and 1999, was called the *Australian School Students Alcohol and Drugs (ASSAD) Survey* on *Self-reported behaviours of NSW secondary school students – sun protection, physical activity, injury and eating patterns* (Schofield et al 1998, 2002). The short questions asked in both survey years are broadly consistent with those of the NNS and NSW Health Surveys (The questions are contained in Appendix 1B).

As in the NNS and NSW Health Surveys, servings consumed are grouped (eg 2-3 serves, 4-5 serves), hence no direct comparison to the AGHE recommendations (at least four serves of vegetables and three serves of fruit) can be made. This is only really important for fruit, as the 4-5 grouping adequately describes numbers of adolescents consuming the AGHE recommended serves of vegetables.

Highlights:

Vegetables (Table 16)

- Vegetable consumption by adolescents was low in both survey years. In 1996 approximately 21% of male and female adolescents reported consuming the recommended four or more serves per day, and in 1999 approximately 20% of adolescents reported consuming four or more serves per day.
- More than a third of all adolescents reported consuming 1 serve or less of vegetables per day.

Fruit (Table 17)

- There were few differences in reported consumption of fruit between the two survey years.
- Older adolescents, particularly males, ate fewer serves of fruit than younger ones.
- In 1999, 25% of males aged 12 years ate one or less serves of fruit each day, compared with 52% of male students aged 17 years. Corresponding percentages for females were 22% and 37% respectively.
- In both survey years, almost 21% of all females ate 4 or more serves of fruit each day, while approximately 30% ate one serve or less each day.

Reported vegetable and fruit consumption values were cross-tabulated to investigate whether there was a trade-off in consumption of one for the other. There was not. In 1999, 77% of students who ate one or less serves of fruit per day also ate one or less serves of vegetables per day. The converse was also true, ie high intakes of fruit were positively associated with high intakes of vegetables (Schofield et al 1998, 2002).

Table 16. Serves of vegetables usually eaten each day, expressed as percentages, by male and female school students in the NSW ASSAD survey, 1996 (n = 10 026) and 1999 (n = 7339)

		Age													
		12		13		14		15		16		17		All	
		1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999
I don't eat vegetables	M	3	3	3	3	3	2	4	3	2	2	2	4	3	3
	F	2	3	3	3	2	3	2	3	2	3	2	2	2	3
1 or less serves	M	33	26	30	32	31	29	36	35	40	36	37	35	34	32
	F	35	28	30	31	34	31	34	31	34	32	35	32	33	31
2-3 serves	M	42	49	35	44	41	43	37	44	39	45	41	40	39	44
	F	45	45	44	44	43	47	42	43	46	45	47	42	44	44
4-5 serves	M	12	12	18	10	14	12	15	12	14	10	9	18	14	12
	F	9	14	15	15	12	12	15	14	13	13	12	18	13	14
6 or more	M	10	9	11	7	10	9	9	5	6	5	10	3	9	7
	F	8	7	7	6	9	6	7	7	5	6	4	6	7	6
Not stated	M	0	1	2	3	0	4	0	1	0	2	1	0	1	2
	F	0	3	0	1	0	1	1	1	0	0	0	0	0	1

Table 17. Serves of fruit usually eaten each day, expressed as percentages, by male and female school students in the NSW ASSAD survey, 1996 (n = 10,026) and 1999 (n = 7,339)

		AGE													
		12		13		14		15		16		17		All	
		1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999	1996	1999
I don't eat fruit	M	2	1	4	2	2	1	2	4	2	3	2	3	2	3
	F	2	1	1	2	1	1	1	2	2	1	1	2	1	2
1 or less serves	M	25	24	32	33	36	33	34	34	40	44	38	49	34	35
	F	26	21	25	24	31	29	31	31	33	33	41	34	30	28
2-3 serves	M	45	44	38	42	38	39	45	46	40	39	35	34	40	41
	F	44	49	52	49	47	47	44	46	44	49	45	43	46	47
4-5 serves	M	16	20	14	14	14	16	12	11	9	8	7	9	12	13
	F	18	16	14	18	13	14	16	13	13	12	11	18	14	15
6 or more	M	11	8	11	7	8	7	6	4	9	4	11	4	9	6
	F	9	11	7	5	8	7	8	6	8	4	2	2	7	6
Not stated	M	1	2	2	2	2	4	0	1	0	2	6	1	2	2
	F	0	2	1	2	0	1	0	1	0	1	0	2	0	1

NSW Child Health Survey 2001 (children 2-12 years)

The NSW Child Health Survey (CHS) investigated the health and wellbeing of children aged 2-12 years in NSW, using short questions via telephone interview. Respondents were asked short questions (see Appendix 1B) about children's usual intake of vegetables and fruit, and 7,916 responses were obtained. Note that the validity of these short questions to assess the dietary intake of children is unknown.

The responses were grouped by number of serves, and the proportion of responses in each category for the age groups 2-4 years and 5-12 years are presented in Tables 18 and 19. The AGHE does not give recommended intakes for children under four years, hence this report uses the recommended minimum for 4-7 year olds of one serve of fruit and two serves of vegetables, for those aged 2-4 years. AGHE recommendations for children aged 8-11 years are a minimum of one serve of fruit and a minimum of three serves of vegetables. (For the purposes of analysis, one serve of vegetables was defined as ½ cup cooked vegetables or 1 cup of salad vegetables; one serve of fruit was defined as 1 medium piece of fruit, 2 tablespoons of dried fruit or ½ cup of fruit juice.)

Mean vegetable consumption in children 2-12 years, amongst both girls and boys, was below the AGHE recommended levels (Table 18).

- 86% of boys aged 2-4 years and 73% of boys aged 5-12 years consumed less than two serves of vegetables per day.
- 84% of girls aged 2-4 years and 77% of girls aged 5-12 years consumed less than two serves of vegetables per day.
- Less than 10% (7.3%) of children aged 5-12 years consumed three serves or more of vegetables per day.
- Only 15% of 2-4 year old and 12% of 5-12 year old children consumed the recommended serves of vegetables (NSW Chief Health Officer's report 2002, data not shown here).

Table 18. Vegetable consumption in schoolchildren, expressed as percentage of children, NSW Child Health Survey 2001 (n=7,916)

Age category	Value	% Consuming by number of serves (95% CI)						Mean	Median
		<1	1<2	2<3	3<4	4<5	5+		
Males									
2-4	1,031	48 (44-52)	38 (34-42)	11 (9-14)	2.0 (1-3)	1 (0.2-)	0.2 (0-0.4)	1.1 (1-1.2)	1.0
5-12	2,944	42 (39-44)	32 (30-34)	18 (16-20)	5 (4-6)	2 (1-3)	1 (0.7-2.0)	1.4 (1.3-1.4)	1.0
Females									
2-4	998	49 (45-54)	35 (31-39)	14 (11--17)	2 (0.7-2)	0.1 (0-0.3)	0 (0-0.1)	1.1 (1-1.1)	1.0
5-12	2,943	39 (37-42)	37 (35-40)	17 (15-19	4 (3-5)	2 (1-2)	0.8 (0.4-1.2)	1.3 (1.3-1.4)	1.1
All									
2-4	2,029	49 (46-51)	37 (34-40)	12 (10-14)	2 (1-2)	0.7 (0.2-1.2)	0.1 (0-0.2)	1.1 (1-1.1)	1.0
5-12	5,887	40 (39-42)	35 (33-36)	18 (16-19)	5 (4.0-5)	2 (1.4-2.2)	1 (0.7-1.3)	1.3 (1.3-1.4)	1.1

Source: 2001 NSW Child Health Survey (HOIST) Epidemiology and Surveillance Branch. Food habits tables

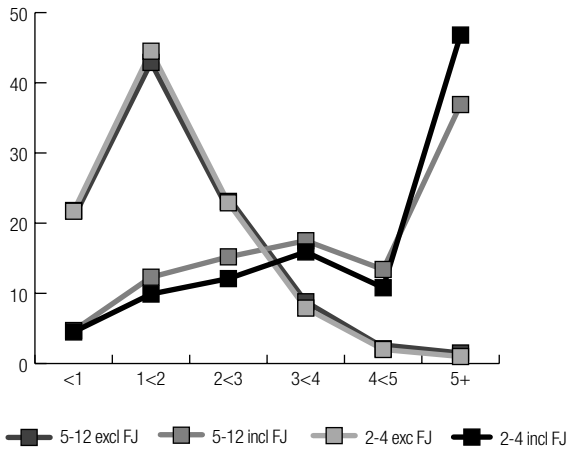
Table 19 shows reported fruit intakes for boys and girls, including and excluding fruit juice. 'Inclusive' of fruit juice reports the consumption of fruit juice and other fruits. 'Exclusive' of fruit juice refers to the intake of fruit only.

- 95.5% of children 2-4 years and 92% of children 5-12 years consume the minimum recommended intake of fruit each day (including fruit juice) (NSW CHO report 2002).
- After excluding fruit juice, 78% of 2-4 year old and 70% of 5-12 year old children consume the minimum recommended intake of fruit (NSW CHO report 2002).
- There is a large difference between the average number of serves of fruit consumed when fruit juice is included and when it is excluded. This large difference indicates that consumption of fruit juice is very high among children.
- Median values indicate that if fruit juice is included in the serves, at least 50% of children consume four serves of fruit per day, ie well above the minimum recommended amount. However, if fruit juice is excluded, then at least 50% of children report consuming only one serve of fruit per day.
- Only about 10% of children were consuming high intakes of three or more serves per day of whole fruit.

The high intake of fruit juice (or fruit juice drink) contributes to a high consumption of sugar, and is likely to displace the consumption of other 'healthier' beverages such as water and milk. Additionally, the consumption of fruit juice, in place of whole fruit, lowers the intake of fibre, and is associated with an increased risk of dental caries.

The high intake of fruit juice in children is further illustrated in Figure 12. This figure shows that among children consuming high intakes of fruit (more than four serves), most of the fruit comes from fruit juice.

Figure 12. Proportion of children aged 2-4 years and 5-12 years consuming serves of fruit, including and excluding fruit juice, NSW Child Health Survey 2001 (n=7916)



Source: 2001 NSW Child Health Survey (HOIST) Epidemiology and Surveillance Branch. Food habits tables

Table 19. Proportion of children consuming serves of fruit, including and excluding fruit juice, NSW Child Health Survey 2001(n=7,916)

Age category	Value	% Consuming by number of serves (95% CI)						Mean	Median
		<1	1<2	2<3	3<4	4<5	5+		
Males									
2-4 incl FJ	1,031	4 (2-6)	9 (7-11)	12 (10-15)	16 (13-18)	11 (9-14)	48 (44-52)	5.0 (4.8-5.3)	4.5
excl FJ	1,031	21 (18-24)	44 (40-48)	24 (21-28)	8 (6-10)	2 (0.9-2)	0.9 (0.3-1.5)	1.5 (1.4-1.5)	1.0
5-12 incl FJ	2,944	6 (5-7)	13 (11-14)	15 (14-17)	16 (14-17)	14 (12-16)	37 (34-39)	4.2 (4.1-4.3)	4.0
excl FJ	2,944	21 (18-24)	44 (40-48)	24 (21-28)	8 (6-10)	2 (0.9-2.4)	0.9 (0.3-1.5)	1.4 (1.4-1.5)	1.0
Females									
2-4 incl FJ	998	5 (3-7)	11 (8-14)	12 (9-15)	16 (13-19)	10 (8-13)	45 (41-49)	4.7 (4.4-4.9)	4.3
excl FJ	998	22 (19-26)	45 (41-49)	22 (18-25)	8 (6-10)	2 (1-4.0)	1 (0.4-2)	1.5 (1.4-1.5)	1.0
5-12 incl FJ	2,943	4 (3-5)	12 (10-14)	15 (14-17)	19 (17-21)	13 (11-14)	37 (35-40)	4.3 (4.1-4.4)	3.9
excl FJ	2,943	19 (17-21)	44 (42-47)	24 (22-26)	9 (8-11)	2 (1-3)	1 (0.7-2)	1.5 (1.5-1.5)	1.0
All									
2-4 incl FJ	2,029	5 (3-6)	10 (8-12)	12 (10-14)	16 (14-18)	11 (9-13)	47 (44-50)	4.8 (4.7-5)	4.5
excl FJ	2,029	22 (19-24)	45 (42-47)	23 (20-25)	8 (7-9)	2 (1-3)	1 (0.6-1.5)	1.5 (1.4-1.5)	1.0
5-12 incl FJ	5,887	5 (4-5)	12 (11-14)	15 (14-16)	18 (16-19)	13 (12-15)	37 (35-39)	4.2 (4.1-4.3)	4.0
excl FJ	5,887	22 (20-23)	43 (41-45)	23 (22-25)	9 (8-10)	2 (2-3)	2 (1-2)	1.5 (1.4-1.5)	1.0

Source: 2001 NSW Child Health Survey (HOIST) Epidemiology and Surveillance Branch. Food habits tables

National Nutrition Survey 1995 – 24-hour recall data (2-18 years)

Vegetable and fruit consumption by children and adolescents was reported using 24-hour recall in the NNS. These consumption data are summarised for boys and girls in NSW in Table 20.

Table 20. Proportion of children and adolescents consuming any vegetables and fruit, by age group and gender, in NSW: 1995 National Nutrition Survey (24-hour recall)

Food type	Age groups (Years)	Male (%)	Female (%)
Vegetables	2-7	68.5	82.8
	8-11	78.0	72.5
	12-18	80.0	87.2
Fruit	2-7	63.0	72.4
	8-11	56.3	63.3
	12-18	48.0	51.1

Source: National Nutrition Survey 1995, NSW Tables 1998

- More children consumed vegetables than fruit.
- A large proportion of children, nearly 50% of 8-11 year old boys and about 50% of all 12-18 year olds, consumed no fruit in the previous 24 hours of the survey.
- Older children, both boys and girls, were less likely than younger children to consume any fruit.
- The proportion of children consuming any vegetables was higher than the proportion consuming any fruit; and was lowest amongst boys aged 2-7 years (68%).

The national data were analysed more extensively recently (Magarey et al 2001). These authors compared intakes with the recommendations of the AGHE, the 1993 Goals and Targets for Australia's Health in 2000 and beyond, and intakes of the 1985 National Dietary Survey. Their analysis included fruit juice and fried potato. Their findings were:

- There was no gender difference in the frequency of fruit consumption.
- Consumption of vegetables was higher in girls than boys overall, but only significantly so in the 4-7 year age group.

- One quarter of children and adolescents did not eat fruit on the day of the survey and one-fifth did not eat vegetables and if fruit juice is excluded, 40% of the total sample and 60% of 16-18 year olds had no fruit on the day of the survey.
- The proportion of children consuming any vegetables was higher than the proportion consuming any fruit; and was lowest amongst boys aged 2-7 years (68%).
- Less than 50% of all children and less than 25% of adolescents had an adequate fruit intake.
- Only one third of children and adolescents met the vegetable intake recommendations.
- There has been little change in vegetable consumption from 1985 and fruit consumption (excluding fruit juice) appears to have declined.

Tooty Fruity Vegie Study – 24-hour recall data (5-11 years)

The Tootie Fruity Vegie study (1999) collected baseline dietary data from 1,400 children in Kindergarten to Year 6, from 16 primary schools across the Northern Rivers region of NSW (response rate 68%), using 24-hour food records (Miller et al 2001). Table 21 summarises vegetable and fruit consumption of 5-11 year olds as measured in this survey. The adults from the Northern Rivers reported consuming significantly more vegetables and fruit than the NSW mean intake, so it is possible the children of this Area may not be representative of NSW children.

- 16% of all children ate no vegetables and 25% ate no fruit in the 24-hour period.
- 35% of children aged 5-7 years ate recommended amounts of vegetables (two or more serves) and only 20-26% of children aged 8-11 ate recommended amounts of vegetables (three or more serves).
- 57% of children ate recommended amounts of fruit (one or more serves).

Table 21 Vegetable and fruit intake by children, by age group and sex, Northern NSW ('Tooty Fruity Vegie' Survey 1999)

For V measure	All children (N = 1400)	Boys (N = 692)	Girls (N = 708)	Age 5-7 (N = 554)	Age 8-9 (N = 406)	Age 10-11 (N = 440)
No fruit eaten	25%	29%	21%	25%	26%	24%
1+ serves fruit eaten 1	57%	53%	60%	55%	57%	58%
No veg eaten	16%	17%	14%	17%	17%	12%
2+ serves veg eaten 2	39%	40%	38%	35%	42%	42%
3+ serves veg eaten 3	21%	21%	20%	17%	20%	26%

Source: Adapted from data provided by 'Tooty Fruity Vegie' Survey investigators Northern Rivers Area Health Service

1 (AGHE recommended intake for children aged 5-11)

2 (AGHE recommended intake for ages 5-7)

3 (AGHE recommended intake for children 8-11)

Varieties of fruits and vegetables consumed among children and adolescents

The varieties of vegetables and fruits eaten by children and adolescents in NSW was recorded during the 24-hour recall survey of the NNS (NSW sub-sample). These data, showing the percentage consumption of different types of vegetables and fruits by those children and adolescents consuming vegetables and/or fruit, are expressed as bar charts in Figures 13-16.

- The figures show the large contribution of one type of fruit, apples, and one type of vegetable, potato, to the overall diets of children and adolescents in NSW.
- The potato category included hot chips, thus it is likely the high amount of potatoes consumed, particularly by adolescent boys, reflects an increasing intake of hot chips.

Figure 13. Mean serves of vegetables. Males 2-18 years of age

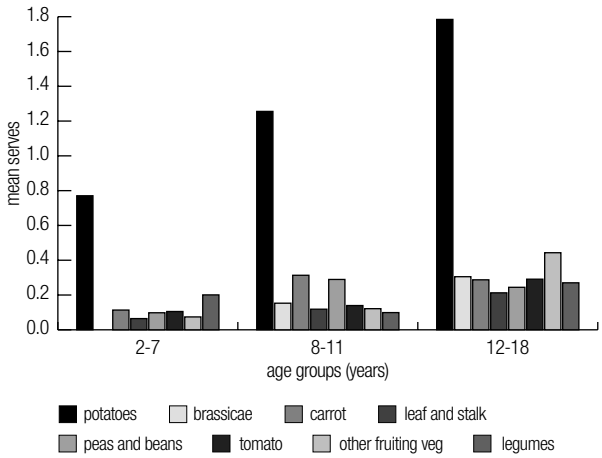


Figure 14. Mean serves of vegetables. Females 2-18 years of age

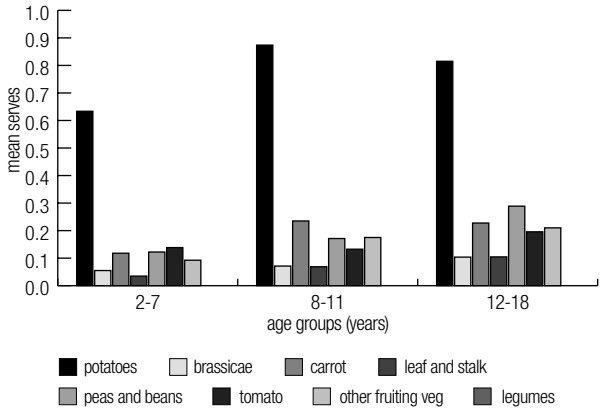


Figure 15. Mean serves of fruit. Males 2-18 years of age

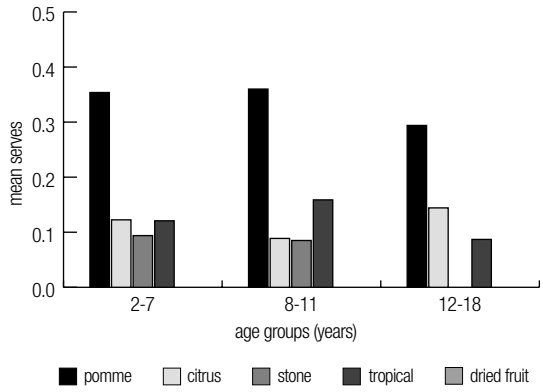
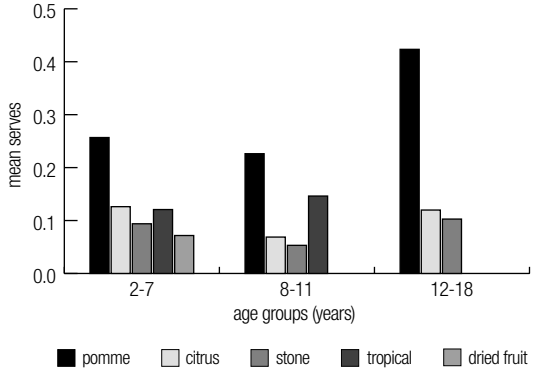


Figure 16. Mean serves of fruit. Females 2-18 years of age



5.3 Population sub-groups likely to consume less vegetables and fruit than the general population

Various population sub-groups were examined for differences in consumption compared to NSW overall. These groups were:

- certain age groups
- socioeconomic Index for Areas (SEIFA) (ABS)
- accessibility/remoteness Index of Australia (ARIA)
- indigenous people
- Area Health Services.

Although the literature has shown that ethnic groups are likely to consume different amounts and types of vegetables and fruits than the general population, data for various ethnic groups in NSW were not plentiful enough to conduct meaningful statistical analyses. Thus these data are not presented. For the same reason, data in this section are provided for NSW as a whole rather than on an Area Health Service basis, except for stratification by age (section 5.3.1).

Age

NSW Heath Survey 1997/1998

Further data from the short questions of the NSW HS for adult consumption of vegetables and fruit, stratified by age and sex, are included in this section. State-based data are provided in the body of the text below, whilst detailed data tables for each NSW Area Health Service are provided in Appendix 3B (Tables 1-34).

Tables 22 and 23 provide vegetable and fruit data from NSW Health Survey, 1997 and 1998, by age (18 years and over) and sex.

Some conclusions for NSW as a whole are indicated below.

Vegetable consumption

- Generally, as adults become older, their intake of vegetables increases.
- Men and women aged 45 and over consumed significantly more vegetables than younger men and women.
- Vegetable consumption was lowest in men aged 18-44 years and women aged 18-24 years.
- For each age group, mean daily vegetable consumption was higher for women than for men.
- Vegetable consumption was highest in women aged 55-64 years – 50% consumed 2.5 serves per day, and mean daily consumption was 2.9 serves.
- 50% of both men and women in all age groups, except women aged 55-64 years, consumed two serves of vegetables per day.
- Adults 75+ years consumed fewer vegetables per day than 65-74 year olds.
- Young men (aged 18-34 years) and young women (aged 18-24 years), should be targeted for promotion of vegetable consumption.

Fruit consumption

- As adults become older their intake of fruit increases.
- Women aged 45 years and over consumed significantly more fruit than younger women. This was evident in the median data indicating that more women in each age group consumed greater quantities of fruit than in the younger age groups.
- Men aged 18-24 years consumed more fruit than men aged 25-44 years.
- Fruit consumption was higher in women than men for all age groups except 18-24 years.
- Median fruit intake was two serves per day for women but only one serve per day for men, indicating that a greater proportion of women ate more serves of fruit per day.
- Men of all ages, but particularly younger men, and young women, should be targeted for promotion of fruit consumption.

Table 22. Number of serves of vegetables usually consumed by male and female adults in NSW, stratified by age, NSW Health Survey 1997/1998: NSW sub-sample

Age category	Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All		8	34	28	12	9	8	2.2	2.0
18-24	1,206	12	37	25	12	7	6	2.0 ↓	2.0
25-34	2,348	11	37	28	11	7	6	2.0 ↓	2.0
35-44	3,333	7	36	32	11	8	7	2.1	2.0
45-54	2,639	6	34	28	13	10	9	2.4 ↑	2.0
55-64	1,933	6	32	27	14	12	9	2.4 ↑	2.0
65-74	1,741	6	29	28	16	11	10	2.5 ↑	2.0
75+	813	5	27	34	11	15	8	2.4 ↑	2.0
Females									
All		5	26	29	18	12	9	2.5	2.0
18-24	1,471	8	34	30	14	7	7	2.1 ↓	2.0
25-34	3,665	6	30	31	16	10	7	2.3 ↓	2.0
35-44	4,445	5	25	31	19	12	9	2.5	2.0
45-54	3,268	5	22	28	20	14	12	2.7 ↑	2.0
55-64	2,588	4	19	28	20	16	13	2.9 ↑	2.5
65-74	2,420	4	22	27	21	15	10	2.7 ↑	2.0
75+	2,420	6	28	29	18	11	7	2.4 ↓	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001

1 RSE of mean all <5%.

↓ significantly lower than mean for all ages

↑ significantly higher than mean for all ages

Table 23. Number of serves of fruit usually consumed by male and female adults in NSW, stratified by age, NSW Health Survey 1997/1998: NSW sub-sample

Age category	Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All		25	35	22	10	7	1.6	1.0
18-24	1,206	26	34	22	10	7	1.6	1.0
25-34	2,348	31	36	19	9	6	1.4 ↓	1.0
35-44	3,333	27	36	22	8	7	1.5 ↓	1.0
45-54	2,639	28	31	22	11	7	1.6	1.0
55-64	1,933	23	35	25	9	8	1.6	1.0
65-74	1,741	19	35	26	12	7	1.7 ↑	1.0
75+	813	15	38	27	11	8	1.7 ↑	1.0
Females								
All		16	33	29	16	7	1.8	2.0
18-24	1,471	17	42	21	12	7	1.6 ↓	1.0
25-34	3,665	19	36	27	12	6	1.6 ↓	1.0
35-44	4,445	18	34	28	15	6	1.7 ↓	1.0
45-54	3,268	16	29	29	19	8	1.9 ↑	2.0
55-64	2,588	14	27	31	20	8	1.9 ↑	2.0
65-74	2,420	12	26	34	20	7	1.9 ↑	2.0
75+	1,486	11	29	35	19	7	1.9 ↑	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001

1 RSE of mean all <5%.

↓ *significantly lower than mean for all ages*

↑ *significantly higher than mean for all ages*

Table 24. Consumption of vegetables and fruit by adults aged 65 and over (expressed as percentage of recommended amounts), for each NSW Area Health Service, Older People's Health Survey, 1999

Recommended quantities of vegetables and fruit eaten each day by Health Area, NSW 1999						
	Vegetables			Fruit		
Health Area	Per cent	LL 95% CI	UL 95% CI	Per cent	LL 95% CI	UL 95% CI
Central Sydney	27.9	23.9	31.8	57.5	53.1	61.8
Northern Sydney	39.9	35.3	44.5	61.8	57.3	66.3
Sth East Sydney	27.6	23.5	31.8	60.2	55.7	64.8
Sth West Sydney	34.3	29.8	38.7	57.3	52.7	61.9
Western Sydney	31.0	26.6	35.4	55.4	50.6	60.2
Wentworth	34.8	30.4	39.2	54.2	49.6	58.7
Central Coast	36.3	32.0	40.6	62.1	57.7	66.4
Hunter	41.7	37.3	46.1	56.6	52.2	61.0
Illawarra	36.7	32.2	41.2	57.4	52.9	62.0
Northern Rivers	41.8	37.3	46.3	59.2	54.7	63.6
Mid North Coast	42.5	37.9	47.0	58.9	54.4	63.5
New England	35.6	31.1	40.0	52.2	47.6	56.8
Macquarie	39.4	34.8	44.0	50.9	46.2	55.5
Far West	37.5	33.0	42.0	46.8	42.2	51.5
Mid Western	40.9	36.3	45.5	54.7	50.1	59.3
Greater Murray	36.8	32.3	41.3	50.1	45.4	54.7
Southern	42.8	38.2	47.5	50.9	46.2	55.6
NSW	36.0	34.8	37.3	57.6	56.3	58.8

Note: Recommended daily quantity of vegetables = 4 serves or more. 1 serve = 1/2 cup cooked vegetables or 1 cup salad vegetables. Recommended daily quantity of fruit = 2 serves or more. 1 serve = 1 medium or 2 small pieces of fruit or 1 cup of diced pieces. Estimates based on 8,881 non-proxy respondents. LL/UL 95%CI = low/upper limits of 95 per cent confidence interval of the estimate.

Source: NSW Older People's Health Survey 1999 (HOIST). Epidemiology and Surveillance Branch, NSW Department of Health NSW Health website: www.health.nsw.gov.au/public-health/ophs99/ophs1999.pdf (June 3 2002)

NSW Older People's Health Survey 1999

Details of the NSW Older People's Health Survey, conducted in 1999, are included in Appendix 1A. The questions that were used in the NSW Health Surveys 1997/1998 were used for older people, aged 65 years and over, in 1999.

Table 24 is taken directly from the NSW Older People's Health Survey Report (2000).

The results of this survey revealed:

- Nearly two thirds of all older people reported not eating the recommended four serves or more per day.
- Nearly half of all older people reported not eating the recommended two serves of fruit per day.
- While both older men and women had similar intakes of vegetables, older females were more likely to eat the two or more serves of fruit per day.
- Only 23.3% of older people reported eating the recommended intake of both vegetables and fruit per day.
- Older people in rural areas were more likely than people from metropolitan areas to consume the recommended serves of vegetables. This was not true for fruit.

Socioeconomic status (SEIFA quintiles)

The NSW Health Survey data indicate (Tables 25 and 26):

- There is no apparent effect of SEIFA quintile on the reported vegetable intake of men or women.

- Women in the most disadvantaged SEIFA quintile were more likely to consume very low intakes of fruit than women in the highest SEIFA quintile (18% compared to 12%).
- The median intake of fruit for most disadvantaged women was 1.5 serves per day, half a serve less than the median number of serves for women in the least disadvantaged quintile.
- The fruit intake of men does not appear to be affected greatly by socioeconomic status. However, the median daily intake for men at all SEIFA levels is half the recommended intake.

Remoteness/access index (ARIA)

Tables 27 and 28 contain data from the NSW Health Surveys 1997/1998, categorised by the Accessibility/Remoteness Index of Australia (ARIA). This index, devised by the Australian Bureau of Statistics, uses distances from service centres to place areas into categories ranging from highly accessible to very remote. Only amounts of vegetables and fruit consumed are reported, not types. The small number of people sampled from the more remote areas makes interpretation of the data difficult – more unlikely to find statistically significant differences or, indeed, any differences.

- There was no consistent effect of accessibility/remoteness on reported vegetable consumption in either males or females, although there was some indication that those in the more remote areas consumed a greater number of serves of vegetables per day.
- Fruit intake was more greatly affected by accessibility/remoteness than vegetable intake. Men and women living in very remote areas consume very low amounts of fruit; almost half of men and a quarter of women reported consuming less than one serve of fruit per day.
- Median intakes for women increased with accessibility. Women in remote and very remote areas have a median intake of 1.0 compared to 2.0 for women in highly accessible and accessible areas.
- Median intake for men was 1.0 for all ARIA categories but mean intake increased with increasing accessibility.
- It is possible that while the total vegetable intake does not vary by socioeconomic status and accessibility/remoteness, the types of vegetables eaten may.

Table 25. Proportion of adults, by number of serves of vegetables usually consumed, by SEIFA quintile and sex, NSW Health Surveys 1997/1998, NSW sub-sample

		% Consuming by number of serves						Number of serves	
SEIFA quintile	**Value**	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**5+**	**Mean[1]**	**Median**
Males									
1st *(least disadvantaged)*	1,716	7	34	31	14	9	6	2.2	2.0
2nd	2,614	8	35	30	13	8	7	2.2	2.0
3rd	3,293	8	35	28	12	9	7	2.2	2.0
4th	3,279	7	37	27	11	10	9	2.3	2.0
5th *(most disadvantaged)*	3,519	10	33	27	11	10	9	2.3	2.0
Females									
1st *(least disadvantaged)*	2,370	4	24	31	19	12	9	2.6	2.0
2nd	3,566	6	27	28	19	11	9	2.4	2.0
3rd	4,571	5	26	30	18	13	10	2.5	2.0
4th	4,522	5	25	30	19	12	9	2.5	2.0
5th *(most disadvantaged)*	4,767	6	29	28	15	11	9	2.4	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001

1 RSE of mean all <5%

Table 26. Proportion of adults, by number of serves of fruit usually consumed, by SEIFA quintile and sex, NSW Health Survey 1997/1998, NSW sub-sample

		% Consuming by number of serves					Number of serves	
Age category	**Value**	**<1**	**1<2**	**2<3**	**3<4**	**4+**	**Mean[1]**	**Median**
Males								
1st *(least disadvantaged)*	1,716	24	37	22	10	7	1.5	1.0
2nd	2,614	25	35	23	10	7	1.6	1.0
3rd	3,293	27	35	21	10	8	1.5	1.0
4th	3,279	26	35	23	10	7	1.6	1.0
5th *(most disadvantaged)*	3,519	26	32	24	10	8	1.6	1.0
Females								
1st *(least disadvantaged)*	2,370	12	32	31	17	7	1.9	2.0
2nd	3,566	16	33	28	17	7	1.8	2.0
3rd	4,571	16	32	29	16	6	1.7	2.0
4th	4,522	17	32	28	16	7	1.7	2.0
5th *(most disadvantaged)*	4,767	18	33	27	14	7	1.7	1.5

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001
1 RSE of mean all <5%

Table 27. Proportion of adults, by number of serves of vegetables usually consumed, by Accessibility/ Remoteness Index (ARIA) and sex, NSW Health Survey 1997/1998, NSW sub-sample

	% Consuming by number of serves						Number of serves	
Aria	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**5+**	**Mean[1]**	**Median**
Males								
Very remote	7	43	24	7	13	7	2.2	2.0
Remote	6	28	25	15	12	14	2.7	2.0
Moderately accessible	6	34	33	10	10	7	2.2	2.0
Accessible	5	34	29	14	10	9	2.3	2.0
Highly accessible	8	35	28	12	9	7	2.2	2.0
Females								
Very remote	4	19	31	19	16	12	2.8	2.5
Remote	4	23	26	18	11	18	3.0	2.1
Moderately accessible	4	27	30	18	14	8	2.5	2.0
Accessible	4	24	28	20	14	10	2.7	2.0
Highly accessible	6	27	30	18	11	9	2.5	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001
1 RSE of mean all <10%

Table 28. Proportion of adults, by number of serves of fruit usually consumed, by Accessibility/ Remoteness Index (ARIA) and sex, NSW Health Survey 1997/1998, NSW sub-sample

	% Consuming by number of serves						Number of serves	
Aria	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**5+**	**Mean[1]**	**Median**
Males								
Very remote	110	46	26	18	5	5	1.2	1.0
Remote	770	37	31	19	9	5	1.3	1.0
Moderately accessible	699	31	37	20	6	6	1.3	1.0
Accessible	3,799	26	36	22	9	7	1.5	1.0
Highly accessible	9,043	25	35	23	10	7	1.6	1.0
Females								
Very remote	162	24	35	22	13	6	1.5	1.0
Remote	1,120	21	35	24	12	8	1.7	1.0
Moderately accessible	983	16	36	27	15	6	1.7	1.5
Accessible	5,390	17	32	28	15	8	1.8	2.0
Highly accessible	12,141	15	33	29	16	7	1.8	2.0

Source: NSW Health Surveys 1997 and 1998 (HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001
1 RSE of mean all <16%

Indigenous people

Data on vegetable and fruit consumption levels in indigenous people were determined from the 1997/1998 Health Survey, and are summarised in Tables 29 and 30. The small number of indigenous people in the survey hampers interpretation of the data, thus no definite conclusions can be made. However, the data indicate the following:

- Vegetable intake was not significantly affected by indigenous status (although mean intake in indigenous men was greater than in non-indigenous men).
- Indigenous women were more likely to consume very low amounts of fruit compared to non-indigenous women, as indicated by 27% compared to 15% consuming less than one serve per day, respectively. Mean intake was also significantly lower in indigenous women than non-indigenous women.

Table 29. Proportion of adults, by number of serves of vegetables usually consumed, by indigenous status and sex, NSW Health Survey 1997/1998, NSW sub-sample

		% Consuming by number of serves						Number of serves	
Indigenous Status	**N**	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**5+**	**Mean[1]**	**Median**
Males									
Indigenous	245	11	31	29	8	11	10	2.5	2.0
Non-indigenous	14,197	8	35	28	12	9	7	2.2	2.0
Females									
Indigenous	386	8	29	29	14	9	10	2.4	2.0
Non-indigenous	19,445	5	26	29	18	12	9	2.5	2.0

Source: NSW Health Survey 1997 and 1998(HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001
1 RSE of mean <16%[

Table 30. Proportion of adults, by number of serves of fruit usually consumed, by indigenous status and sex, NSW Health Survey 1997/1998, NSW sub-sample

		% Consuming by number of serves					Number of serves	
Indigenous Status	**N**	**<1**	**1<2**	**2<3**	**3<4**	**4<5**	**Mean[1]**	**Median**
Males								
Indigenous	245	28	31	23	12	6	1.5	1.0
Non-indigenous	14,197	25	35	22	10	7	1.6	1.0
Females								
Indigenous	386	27	30	22	15	6	1.5*	1.0
Non-indigenous	19,445	15	33	29	16	7	1.8*	2.0

Source: NSW Health Survey 1997 and 1998(HOIST), Epidemiology and Surveillance Branch, NSW Department of Health 2001
1 RSE of mean <10%
** significant difference between mean for indigenous and non-indigenous females*

5.4 Area Health Service data

As indicated above, data on an Area Health Service basis for age and sex are reported in Appendix 3B (Tables 1-34). To provide an example of how to interpret the age and sex stratified tables, some hypothetical data sets of vegetable and fruit consumption by adults, stratified by age and sex, have been created for a typical rural and a typical metropolitan AHS (Appendix 3C, Tables 3C.1-4). These tables are then compared to those for NSW as a whole (Tables 22 and 23) and comparisons are detailed in bullet points.

6 Barriers to consumption of vegetables and fruit

6.1 Barriers to consumption

An understanding of the underlying reasons for low consumption of vegetables and fruit assists in developing, targeting and evaluating promotional strategies.

Evaluations of campaigns implemented in the 1990s by health departments in Western Australia and Victoria, and internationally by coalitions in New Zealand, the USA, and the UK, have identified a number of barriers to increasing vegetable and fruit consumption (Dixon et al 1998; Foerster et al 1998; 5 + A day NZ: Miller et al 1997). Some of these are discussed below.

> *'Barriers to increasing fruit consumption differ significantly to those for vegetable consumption, with most people more amenable to increasing the consumption of fruit than of vegetables'*
>
> *(Miller and Pollard 1997)*

Knowledge

People:

- believe, incorrectly, that the quantities of vegetables and fruit they are eating are the recommended amounts. In a survey by the Health Department of Western Australia (HDWA), over two-thirds of people believed they were already consuming enough vegetables and 41% of people believed they were already consuming enough fruit (HDWA 2001)
- don't know what constitutes a serve, nor what the recommended servings per day are (Krebs-Smith 1996)
- have limited knowledge of how to select, store and prepare fresh vegetables
- have little knowledge of the consequences to health associated with not eating enough vegetables and fruit (Table 31), although they do have some knowledge of the health benefits, eg protective effects against cancer.

Table 31. Percentage of people in a survey in WA, 1995 who knew of specific health problems associated with low fruit and vegetable consumption

Health Problem	%
Vitamin and mineral deficiencies	50
Constipation and other bowel problems	37
Lethargy and lack of energy	14
Poor immunity	11
Skin problems	11

Source: Nutrition and Physical Activity Program of the Health Department of Western Australia Bulletin Feb 2001

Family and cultural influences

Family

- Low vegetable and fruit consumption in families results from a tendency to stick with a limited but familiar (and 'favourite') set of foods/meals and an avoidance of experimentation with food items (Foerster et al 1997).
- More meals are eaten in front of the television, not in the family setting, hence meals are often associated with the consumption of convenience foods (Thompson et al 1999).
- Food choices and preferences of partners and other household members limit meal type (Thompson et al 1999).
- Exposure to vegetables in a positive social context is important.
- Vegetables need to be portrayed as being more accessible and more palatable than currently perceived.

Children

- Food preferences and habits are formed in childhood and tend to be maintained into adulthood (Krebs-Smith 1995).
- Negative parental practices in terms of vegetable and fruit consumption are associated with poor vegetable and fruit consumption in children (Van Duyn 2001).

- Mothers' beliefs in the importance of vegetables and fruit in disease prevention affects children's consumption (Gibson et al 1998).
- Parents may limit exposure to vegetables (and, to a lesser extent, fruit) if the items are rejected on the first few occasions (Van Duyn 2001).
- Children prefer the more palatable, high fat and high sugar foods, and consider that vegetables have 'unattractive sensory properties' (Gibson et al 1998).
- Parental threats of consequences for non-consumption render vegetables and fruits less desirable.
- Children have less concern with nutritional attributes, rather they attach importance to taste, texture, shape, fun, etc. (Baltas 2001). They find fruit 'boring, too variable in taste and texture, and a hassle to eat' (Paterson and Miller 1985). For vegetables, barriers include 'taste, texture, smell and appearance'.
- Children are particularly scared to try new foods (food neophobia), especially vegetables.
- Exposure to vegetables in a positive social context is particularly important in children (Nicklas 2001) and repeated exposure to a variety of vegetables and fruit may increase acceptance in children.

Increase in consumption of convenience foods

- Lifestyle and convenience options are beginning to 'squeeze' the traditional place of vegetables at mealtimes. For example, the advent of 'just add meat' pre-prepared sauces has revolutionised cooking but possibly at the expense of vegetable dishes (5 + A Day NZ).
- Vegetables are viewed as more time-consuming to prepare than other foods (Stafford 1997).

Attitude

- The low vegetable and fruit consumer can be described as having a lack of knowledge of recommended intakes, but most importantly, they believe that they are already consuming enough vegetables and fruit. This belief no doubt stems from their attitudes of what actually constitutes a healthy diet (HDWA 2001, Balach 1997).
- People, particularly in the 18-34 age group, consider that vegetables take too much time and effort to prepare (HDWA 2001).
- Consumers are not interested in negative health messages associated with low vegetable and fruit consumption, particularly of later-in-life health problems such as cancer (viewed as 'implausible' or 'irrelevant') (Balach et al 1997). Rather, they are concerned with immediate offers of health and vitality such as increased energy, flexibility of body, and physical appearance, as well as a healthy heart, boosted immune system, and reduced stress. In other words, they want to be healthy, energetic and feel/look good now.
- Consumers see little urgency to eat more vegetables and fruit, and this is more evident if they are not involved in food planning (Balach et al 1997).
- Taste – 8% of adults in the WA survey indicated dislike of vegetables and 16% indicated dislike of fruit as the main reason for not eating more (HDWA 2001).
- People consider that it is easier to increase fruit than vegetable consumption as it is more convenient and has a profile as a 'snack food' (HDWA 2001).
- Other attitudes in the popular press include 'healthy eating is just another fashion' and 'experts never agree'.

Motivators/disincentives

- Generally, people know that vegetables and fruit are good for them, but this is not a strong motivator for people to consume recommended quantities or to increase consumption.
- In the 1995 NNS, people were asked to indicate their desire to increase vegetable and fruit intake. More than a third of males and, particularly, females, aged 45 years and under, indicate a desire to increase their intake of vegetables and fruit (Table 32). However fewer people aged over 45 years indicated a desire to increase intakes. This lesser desire in older people may be linked to the fact that they already consume more serves per day anyway (Section 5).
- Similar results were obtained in a survey in Western Australia in 1995, in which only about 30% of the 1,000 adults surveyed considered increasing their intake.

Table 32. Percentage of men and women (aged >15 years) in Australia who indicate a desire to increase their vegetable and fruit consumption

	16-18	19-24	25-44	45-64	65 and over
Male	30.5	45.3	37.3	21.5	9.5
Female	39.9	45.0	35.8	20.6	8.2

Source: National Nutrition Survey Selected Highlights Australia 1995: Cat no. 4802.0

The *Health Department of WA Bulletin* indicated the following reasons why people report increasing their vegetable and fruit consumption:

- to improve current health in general – over 50%
- for weight loss or control – 14% (up to 21% for fruit)
- the influence of other people – 16%
- to set a good example for children – 6%.

Benefits associated with the prevention of chronic diseases appear to become more important and apparent in the 55+ age group. Preventing constipation, lowering cholesterol and managing diabetes are some of the key considerations.

An industry funded survey of supermarket shoppers in Melbourne and Sydney (Coles 2000) (n=500) revealed that the two main issues that consumers wished to hear concerning vegetable and fruit consumption were:

- positive health messages
- individualised messages.

Van Duyn (2001) reports the following:

- The variables positively associated with high intake of vegetables and fruit include self-efficacy, taste preference and a belief that they contain vitamins and minerals.
- Negative associations include meat preference, neophobia and high fat cooking practices.
- Social pressure is strongly associated with a reported intention to increase consumption of vegetables and fruit.

The ways in which people are increasing their consumption of vegetables and fruit can assist in program development. Some of these ways are listed in Table 33.

Table 33. How are people increasing consumption?

Vegetables	Fruit
• buying more • cooking more each meal • using new recipes • increasing variety and eating more	• buying more • eating a variety or larger amounts • eating fruit as a snack • substitute for other foods • taking fruit to work or school or university • having it more available at home

Source: HDWA Bulletin 2001

Social, economic and demographic factors

The following socioeconomic and demographic factors are associated with low levels of consumption, as they affect people's ability to access vegetables and fruit either directly or indirectly (Dittus et al 1995; Pollard et al 2001; Giskes et al 2002):

- low income
- low educational status
- being male
- being single
- smoking.

6.2 Supply

Supply of vegetables and fruit for the purposes of this report include:

- price
- availability
- quality
- variety
- marketing.

These, in turn, are largely driven by the following factors: farming/production; processing; wholesale and retailing; and transportation of vegetables and fruit.

Apparent consumption data

Few, if any, data are available for access on supply of vegetables and fruit in NSW. However, nationally there is the *Apparent Consumption of Foodstuffs Collection*, which is a derived series that provides a general overview of the supply and utilisation of approximately 130 basic foodstuff groups for the mean resident population in Australia.

The information focuses on the major food groups and covers the quantity of food available (supply), where the food supply goes (utilisation) and the amount of food apparently consumed by each person. The term 'apparent consumption' is used because it is assumed that all the foodstuffs available are consumed

> Apparent consumption
> = (commercial production + estimated home production + imports + opening stocks) minus (exports + usage for processed food + non-food usage + wastage + closing stocks) divided by the population.

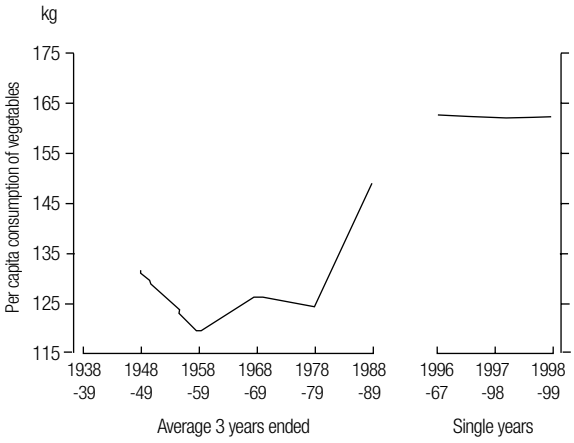
Vegetables

In 1998-99 the total apparent per capita consumption of vegetables was 162.0 kg. This figure was higher by 45.0 kg than the consumption measured in the late 1950s of 117.1 kg per capita. More recently, over the last decade, consumption of vegetables has shown a steady 9.4% increase (Figure 17).

Over the most recent years for which there are data:

- Per capita consumption of tomatoes showed a significant increase from 20.9 kg in 1997-98 to 24.9 kg in 1998-99, a rise of 19%. (This level of consumption was preceded by a fall in per capita consumption of tomatoes by 19.3% in 1997-98 to 20.9 kg, followed by a rise in 1998-99 of 18.9%).
- Although per capita consumption of potatoes fell by 5.8% to 68.0 kg in 1998-99, it remains the most popular vegetable. Other root and bulb vegetables showed an increase of 2.9% during that period to a per capita consumption of 24.4 kg. The per capita consumption of leafy and green vegetables fell 6.5% in 1998-99 to 19.5 kg, following a decrease of 3.2% in 1997-98. The category 'other vegetables' showed a 4.6% increase in per capita consumption from 1997-98 to 1998-99, to 25.1 kg per capita.

Figure 17. Per capita consumption of vegetables, 1938-1998



Fruit and fruit products

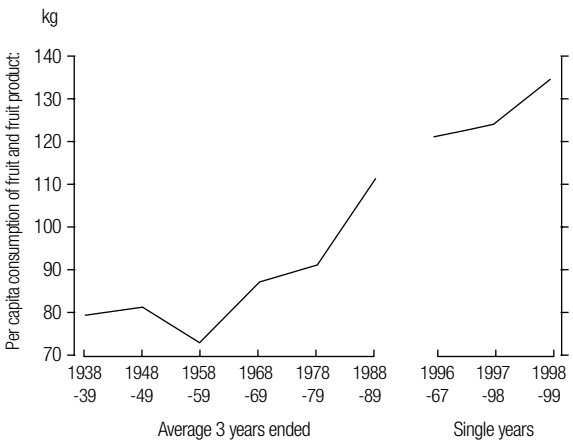
The recorded per capita consumption of fruit and fruit products (including fruit for fruit juices) has increased by about 56.1% since the late 1960s, and 71.5% since the late 1930s (Figure 18).

During the period 1997-98 and 1998-99, fruit consumption increased by 8.3% from 124.7 kg per capita to 135.0 kg. In the same period, imports for oranges and other citrus fruit rose by more than 62%.

The increased consumption figures for 1998-99 were largely due to a 21.7% increase in the availability of citrus fruits, mainly oranges. Imports of fresh and processed oranges increased to 602,610 tonnes, 57.0% of the total supply, while commercial production of oranges contributed 445,840 tonnes, 42.0% of supply.

Per capita consumption of processed fruit rose by 0.9% to 6.8 kg, while dried fruit consumption also rose by 4.1% to 3.0 kg per capita. In contrast to citrus, the per capita consumption of other fresh fruit fell in 1998-99 by 0.5% to 55.4 kg.

Figure 18. Per capita consumption of fruit and fruit product, 1938-1998



Price, availability, variety and quality

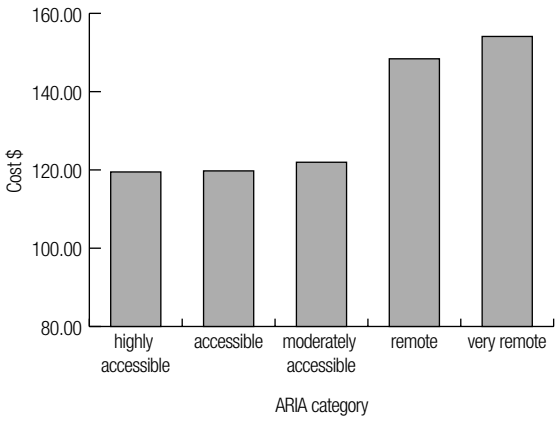
There have been no statewide cross-sectional surveys in NSW examining costs of basic food items, including vegetables and fruit. However, Queensland, South Australia, and Western Australia have conducted 'Health Food Access Basket surveys' or similar over the past few years.

The *Queensland 2000 Healthy Food Access Basket* (QHFAB) survey was a cross-sectional survey of the cost of food items, including tobacco and take-away food items, and 'healthy food choices' or the HFAB – Healthy Food Access Basket. The HFAB included legumes, fruit – fresh, tinned, and frozen, and orange juice. The survey was carried out in 92 selected stores in locations with varying degrees of accessibility and remoteness according to the ABS ARIA index. It should be noted that this survey was conducted prior to the introduction of the GST and the results of a subsequent survey conducted in 2001 are not yet available.

The QHFAB found that the cost of the HFAB increased according to level of remoteness (see Figure 19). The cost of the HFAB in the very remote areas was 31% higher than the cost of the same food basket in highly accessible areas. People in remote and very remote areas paid an extra 24% and 29% respectively for vegetables and fruit and legumes. However, the price differential between remote and accessible areas was not as high as anticipated, when taking into account the cost of transport.

This survey identified a smaller price disadvantage in remote areas for less healthy items – takeaway foods and tobacco – than for healthy items. Some very remote indigenous food stores use profits from the sales of tobacco and takeaway foods to subsidise the costs of vegetables and fruit, to enable supply to customers.

Figure 19. Cost of fruit, vegetables and legumes in Queensland, 2000



Source: Public Health Service, Queensland Health 2001.

The QHFAB survey also examined the availability of various foods. A wider variety of vegetables than fruit was available in remote areas. There was a definite trend in reduction of varieties available for purchase in the remote and very remote areas.

In the survey from the Western Australia Vegetable and Fruit Program:

- 23% of people reported lack of variety and poor quality as the major barriers to increased fruit consumption, and 14% identified these factors as the main barriers to vegetable consumption. (This information refers to fresh produce).
- 7% of people considered high cost to be the most significant barrier to increased vegetable consumption, and 16% of people considered that fruit was too expensive (HDWA 2001).
- Wastage or spoilage of vegetables and fruit were not seen as barriers to consumption. This may be related to the high cost of fresh produce and the unwillingness to waste money on inedible food.
- People indicated that lack of availability of vegetables and fruit in canteens, worksites, restaurants, take-away food outlets, local shops, and institutional settings such as hospitals and childcare settings, was a barrier to increased consumption (Cox et al 1996).

These barriers are particularly relevant in non-metropolitan areas (refer to section 5.3 for information about intakes relating to socioeconomic status and level of remoteness).

7 Recommendations

The body of this report has provided ample evidence of the imperative need to increase both the *amount* and *variety* of vegetables and fruit consumed by residents of NSW, to improve their health. To address this need, there is a requirement for effective strategic planning and decision-making concerning appropriate programs and interventions. However, successful program development and implementation depends to a large extent on being well informed, and NSW currently does not have the data to answer all of the pertinent questions. Thus this section of the report describes ways to fill the information gaps.

Much of this information will come from increased and improved monitoring, hence this is the focus of most of the recommendations. Of particular importance is the use of standardised monitoring techniques, such as standardised indicators, survey questions, and categories for reporting levels of consumption.

1 Vegetable and fruit consumption in NSW should continue to be monitored through the NSW Health Survey program and the NSW sub-sample of ABS Health Surveys that include questions about diet. Key findings should be summarised for vulnerable sub-groups and the whole population and be disseminated widely to health workers and other stakeholders in NSW. This process should occur approximately every three years, as the most effective interventions often take at least this period of time to make a detectable difference in population consumption levels.

2 The importance of consumption of a variety of vegetables and fruit has been highlighted in this report. Thus, relevant questions in health surveys need to provide information about types of vegetables consumed. It is recommended that a special module of questions pertaining to vegetable and fruit consumption be incorporated periodically into the NSW Health Survey, drawing on questions of known validity, as identified by the Australian Food and Nutrition Monitoring Unit (Rutishauser et al 2001, Marks et al 2001). It is recoginsed that such a module would need to be restricted in the number of questions asked.

3 In addition to monitoring the amounts and types of vegetables and fruit eaten, the 'why' questions need to be answered. Aspects of access to and supply of vegetables and fruit, including availability, cost, quality, and variety, are known to be important determinants of or contributors to consumption. Such information is therefore needed in NSW. Some Area Health Services are already collecting this information.

   Valid and standardised methods for collection are required so that data from various areas within NSW and within other states can be compared. Several approaches, such as market basket surveys, have been used successfully in several states and selected local communities, and could serve as the basis for a nationally standardised approach to monitoring aspects of supply and access to vegetables and fruit. The Australian National Monitoring and Surveillance Unit has proposed a project to develop standard methods for monitoring aspects of the food supply nationally, and the commissioning of this work should be supported in NSW.

4 Currently few data exist on trends in sales of vegetables and fruit (fresh, frozen and canned), particularly fresh produce. The increasing introduction of more sophisticated scanning systems in supermarkets and stores creates the possibility for gathering data on quantity and variety sold. A system for obtaining and using scanning data to monitor aspects of vegetable and fruit supply and access should be explored nationally, within the scope of the work described in point 3, above.

5 Information about key modifiable determinants of vegetable and fruit consumption and how these are changing, particularly in the most vulnerable sub-groups, will assist program design, targeting and evaluation. Some states, notably Western Australia, already monitor beliefs and attitudes related to vegetable and fruit consumption in population health surveys. Hence the incorporation of suitable validated questions in NSW surveys is advised, perhaps within a special module on vegetables and fruit, as recommended in point 2, above.

6 The crux of sustained interest in promotion of vegetable and fruit consumption is the information and, importantly, reinforcement of the information, of the benefits to health. Research literature indicating the link between vegetable and fruit consumption and long-term positive health benefits continues to grow and is constantly updating. It is therefore important that research findings are summarised periodically (every three years is suggested, to coincide with information on consumption) for practitioners and decision-makers to use in support of interventions and advocacy efforts.

7 Perhaps as important as updated knowledge about the health benefits of vegetable and fruit consumption, is the translation of these into economic benefits. Economic evaluation of the implications of low intake of a narrow range of vegetables and fruit currently involves the use of limited data in Australia. The $24.4 million/year savings (apportioned to increasing vegetable consumption by one serve a day) quoted in this report is related to the treatment of only four diseases – colorectal, breast, lung and prostate cancer. It is thus a considerable underestimate of the actual health care savings that increased consumption of a variety of vegetables and fruit would provide. An estimation in NSW of the substantial health care savings that can be gained from increased vegetable and fruit consumption would provide a rationale for enhanced investment in this priority.

8 The data contained in this report have varied applications. However, care needs to be taken in its interpretation. Where available, consumption data are provided at local Area level. However in some cases sample sizes were small, hence standard errors were often large and thus not reported. Areas are advised to compare their local data available on HOIST, with state estimates rather than with other Areas, and/or to note the statistical significance of the differences. Data for specific sub-groups is provided only on a state basis due to small sample sizes. Area Health Services should use their local census data, together with their knowledge and understanding of the local population, to apply the generalities drawn from the data provided in this report to their own area.

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Appendix 1A

Survey descriptions

National Nutrition Survey, 1995

The 1995 National Nutrition Survey (NNS) was a large survey of food and nutrient intake, dietary habits and physical measurements in a representative sample of the Australian population aged two years and over. It was conducted by the ABS and the Commonwealth Department of Health and Aged Care. The survey collected information from a sub-sample of approximately 13,800 people who were respondents from the 1995 National Health Survey, from urban and rural areas of Australia (2881 respondents from NSW).

Participants provided dietary information using a 24-hour recall, a food frequency questionnaire (FFQ) and short questions about food habits. Intake of energy and a broad range of nutrients were analysed. Information about the quantity of food groups and sub-groups consumed was reported. Participants had their weight, height, waist and hip measured by trained interviewers, and subsequently information about 'weight for height' (in children 2-8 years) and Body Mass Index (9 years and over) has been reported. Data are presented by age and sex. National data have been reported in a series of four documents produced by the ABS, and additional unpublished state tables have been produced. State tables have been used in the data presented in this report.

NSW Health Survey 1997, 1998

The 1997/1998 NSW Health Surveys, administered by the NSW Department of Health, included 35 025 subjects (aged 16 years and over) throughout NSW, a series of health-related questions, using a computer assisted telephone interview (CATI). Data are available electronically for each Area Health Service and for the state as a whole. Data are reported by sex, age, ARIA category, country of birth, language spoken, socioeconomic status (SEIFA quintile), level of education, labour force category, and indigenous status (www.health.nsw.gov.au).

Self-reported weight and height data has been used to derive BMI. Short questions on food habits provide information about foods consumed: vegetable and fruit serves, type of milk consumed, processed meats, breads and cereals.

NSW Older People's Health Survey 1999

The New South Wales Older People's Health Survey 1999, was a telephone survey of randomly selected households in NSW. Carried out by the NSW Department of Health in late 1999 and early 2000, the purpose was to collect information on lifestyle, self reported health and well being of NSW residents aged 65 years and over. A total of 9418 respondents within the 17 Area Health Services (approximately 500 respondents per Area Health Service) agreed to participate.

NSW Child Health Survey 2001

The purpose of the survey was to collect data on the health and wellbeing of children 0-12 years old in NSW, to inform the planning, implementation and evaluation of health services and programs by the NSW Department of Health.

The NSW Child Health Survey was a computer assisted telephone interview survey conducted between March and September 2001. The sample population comprised children 0-12 years from households selected by list-assisted random digit dialling across the state, with a target of 500 children from each of the 17 Area Health Services in NSW. The response rate was 84% (n = 9425).

Questions examined the determinants of health (eg family functioning, social support, childhood activities and attendance at childcare, preschool and school); health behaviours (including nutrition questions and several questions about children's vegetable and fruit consumption), health status, and use of health services. Questions about vegetable and fruit consumption addressed the number of serves of fruit, salad vegetables, hot chips, cooked vegetable and fruit juice. A report of the survey findings has been released and is published on the NSW Health website: www.health.nsw.gov.au/public-health/epi/research.html.

Australian Secondary Students Alcohol and Drug Survey 1996, 1999

This is a national survey on the use of alcohol and drugs by secondary school children in Australia, with individual state components coordinated by the Centre for Behavioural Research in Cancer in Victoria. The sample is designed to represent students from all types of schools. It provides statistically significant national and state-specific estimates for each age and sex group. The survey has been administered in 1996 and 1999 by the NSW Cancer Council in NSW schools in cooperation with the NSW Department of Health.

Members of the research team administer a written questionnaire to students at school. Students answer the questionnaire anonymously. The presence of teachers during the survey is discouraged. The core questionnaire covers the use of tobacco, alcohol, over-the-counter medicines (used for non-medical purposes) and illicit substances. The NSW version of the survey has a range of additional health-related questions added to the base survey. In 1996 and 1999 NSW has included questions on the consumption of vegetable and fruits. More information is available from the NSW Centre for Health Promotion.

Schofield WN, Lovelace KS, McKenzie JE. Self reported behaviours of NSW secondary school students – sun protection, physical activity, injury and eating patterns. *The 1996 Australian School Students' Alcohol and Drugs Survey*. NSW Cancer Council, NSW Department of Health, 1998.

Appendix 1B

Survey questions

National Nutrition Survey 1995

The NNS asked participants (n = 2,881 for NSW, aged 2 years and over) about foods eaten in the previous 24 hours. This data has been used to describe total amount of foods consumed and food types. Additionally, participants completed a descriptive food frequency questionnaire and short questions about their intake of vegetables and fruit.

1. How many serves of vegetables do you usually eat each day? *(a 'serve' = 1/2 cup of cooked vegetables or 1 cup of salad vegetables.)*
   - ☐ 1 serve or less
   - ☐ 2-3 serves
   - ☐ 4-5 serves
   - ☐ 6 serves or more
   - ☐ don't eat vegetables
2. How many serves of fruit do you usually eat each day? *(a 'serve' = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces.)*
   - ☐ 1 serve or less
   - ☐ 2-3 serves
   - ☐ 4-5 serves
   - ☐ 6 serves of more
   - ☐ don't eat fruit

The same short questions were used in the NSW HS (1997 and 1998, n = 35,025), however responses were not pre-grouped.

NSW Child Health Survey 2001

1. How many serves of fruit does [child] usually eat in a day, including fresh, canned and dried fruit? *(1 serve=1/2 piece fruit, 1/3 cup canned fruit, 1 tablespoon of dried fruit.)*
   - ☐ serves per day _____
   - ☐ serves per week _____
   - ☐ doesn't eat fruit
   - ☐ don't know
   - ☐ refused
2. How many serves of salad vegetables or raw vegetables does [child] usually eat in a day? *(1 serve=1/4 cup salad or 4 vegetable sticks.)*
   - ☐ serves per day _____
   - ☐ serves per week _____
   - ☐ doesn't eat salads or raw vegetables
   - ☐ don't know
   - ☐ refused
3. How many serves of hot chips or french fries does [child] usually eat in a day? *(1 serve=1/2 cup chips or French fries.)*
   - ☐ serves per day _____
   - ☐ serves per week _____
   - ☐ doesn't eat french fries or hot chips
   - ☐ eats less than once a week
   - ☐ don't know
   - ☐ refused
4. How many serves of cooked vegetables (including potato) does [child] usually eat in a day? *(1 serve=1/4 cup cooked vegetables.)*
   - ☐ serves per day _____
   - ☐ serves per week _____
   - ☐ doesn't eat other cooked vegetables
   - ☐ don't know
   - ☐ refused

The 1999 Australian School Students' Alcohol and Drugs Survey

Self reported behaviours of NSW secondary school students – sun protection, physical activity, eating patterns, and injury.

1. How many serves of vegetables do you usually eat each day? *(A serve = 1/2 cup of cooked vegetables or 1 cup of salad vegetables.)*

   ☐ 1 serve or less

   ☐ 2-3 serves

   ☐ 4-5 serves

   ☐ 6 serves or more

   ☐ I don't eat vegetables

2. How many serves of fruit do you usually eat each day? *(A serve = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces.)*

   ☐ 1 serve or less

   ☐ 2-3 serves

   ☐ 4-5 serves

   ☐ 6 serves or more

   ☐ I don't eat fruit

Appendix 2A

'per consumer' tables (NNS NSW sub-sample 1995)

Table 2A. Consumers of different types of vegetable and fruits, by age categories adults, 19 years and over, in NSW

	19-24 Years			25-44 Years			45-64 Years			65-74 Years			75 + Years			All Adults +19 Years		
Food subtype	%	g	sv's	%	g	sv's	%	g	sv'	%	g	sv's	%	g	sv's	%	g	sv's
Male		*N=94*			*N=431*			*N=318*			*N=148*			*N=71*			*N=1,062*	
Fruit	**31.9**			**47.4**			**57.7**			**66.4**			**67.6**			**50.9**		
pomme	11.8	166	1.1	21.8	140.0	0.9	26.2	161.0	1.1	30.4	140.0	0.9	29.7*	108.0	0.7	22.8	140.0	0.9
citrus	7.5*	131.0*	0.9*	11.3	131.0	0.9	16.2	131.0	0.9	13.7*	131.0	0.9	19.9*	101.0	0.7	12.8	131.0	0.9
stone	.	216.0*	1.4*	7.1	198.0	1.3	9.2	151.0	1.0	16.1*	145.0	1.0	10.3*	88.0*	0.6*	8.1	151.0	1.0
tropical	14.7	102.4	0.7	20.1	102.4	0.7	24.8	102.4	0.7	33.4	101.0	0.7	33.4*	102.4	0.7	22.6	102.4	0.7
dried fruit	2.5*	31.8*	0.2*	6.1	21.0	0.1	5.5*	42.5	0.3	11.3*	40.0	0.3	15.8*	43.5	0.3	6.4	34.0	0.2
melons and grapes	3.9*	349.0*	2.3*	9.0	151.0	1.0	9.7	165.0	1.1	10.7	99.8	0.7	8.7*	84.5	0.6*	8.6	158.0	1.1
Vegetables	**87.1**			**87.8**			**92.9**			**92.2**			**93.1**			**89.8**		
potatoes	58.7	165.0	2.2	44.9	183.8	2.5	54.8	178.0	2.4	60.4	127.0	1.7	60.6	122.5	1.6	52.0	165.0	2.2
brassica	19.4	76.4	1.0	16.5	78.0	1.0	22.7	66.0	0.9	26.7	66.7	0.9	26.8*	97.0	1.3	20.2	76.4	1.0
carrot	28.0	37.0	0.5	46.4	44.0	0.6	41.5	43.0	0.6	42.3	50.0	0.7	0.4	38.3	0.5	37.5	44.0	0.6
leaf and stalk	28.0	43.5	0.6	41.0	29.0	0.4	43.5	29.0	0.4	37.2	41.7	0.6	36.7*	30.5	0.4	39.4	31.3	0.4
peas and beans	21.0	80.0	1.1	22.4	75.0	1.0	32.5	67.6	0.9	34.5	70.0	0.9	25.1*	80.0	1.1	26.5	70.0	0.9
tomato	32.6	75.0	1.0	41.9	63.3	0.8	47.1	60.0	0.8	38.1	60.0	0.8	36.5*	60.0	0.8	41.4	60.0	0.8
other fruiting veg	37.7	60.8	0.8	30.8	58.8	0.8	41.8	53.6	0.7	39.1	58.8	0.8	30.6*	59.7	0.8	35.7	56.7	0.8
legumes	7.0	93.5*	1.2*	9.6	86.7	1.2	11.9	107.5	1.4	5.5*	137.5*	1.8*	10.1*	130.0*	1.7*	9.5	97.5	1.3
other	46.9	56.0	0.7	37.9	53.4	0.7	39.9	66.0	0.9	36.7	42.0	0.6	34.0*	44.9	0.6	39.5	55.0	0.7
Female		*N=107*			*N=510*			*N=367*			*N=155*			*N=101*			*N=1,240*	
Fruit	**47.2**			**54.9**			**70.1**			**71.9**			**79.2**			**62.0**		
pomme	24.2	166	1.1	22.3	140	0.9	29.4	140	0.9	39.8	112	0.7	37.5	112.0	0.7	27.6	140.0	0.9
citrus	3.8*	86.0*	0.6*	12.7	131	0.9	17.1	131	0.9	16.7	131	0.9	23.6	131.0	0.9	14.2	131.0	0.9
stone	5.3*	56.7*	0.4*	9.3	151	1.0	13.1	151	1.0	12.7*	116	0.8	18.0*	132.5	0.9	10.9	145.0	1.0
tropical	24.4	102.4	0.7	24.3	102.4	0.7	27.4	101	0.7	37.3	96	0.6	38.6	101.0	0.7	27.7	102.4	0.7
dried fruit	3.7*	27.2*	0.2*	4.5	13.9	0.1	9.2	32	0.2	7.9*	30	0.2	20.8*	24.0	0.2	7.3	27.2	0.2
melons and grapes	6.2*	120.8*	0.8*	13.5	99.8	0.7	16.3	88.7	0.6	13.1	126.8	0.8	14.4*	132.5	0.9	13.5	104.8	0.7
Vegetables	**91.2**			**89.2**			**90.2**			**93.5**			**93.3**			**90.5**		
potatoes	46.1	122.5	1.6	42.1	127.0	1.7	48.2	142.0	1.9	62.7	100.0	1.3	66.9	111.0	1.5	48.4	122.5	1.6
brassica	21.2	76.5	1.0	19.1	66.0	0.9	28.0	69.5	0.9	23.2	66.0	0.9	39.5	66.0	0.9	23.8	66.0	0.9
carrot	36.7	30.9	0.4	36.9	37.0	0.5	39.9	46.0	0.6	38.5	41.3	0.6	47.7	38.2	0.5	38.7	40.0	0.5
leaf and stalk	40.3	43.5	0.6	47.1	29.0	0.4	48.5	29.0	0.4	41.4	38.3	0.5	32.6	29.0	0.4	45.2	29.0	0.4
peas and beans	19.3	75.0	1.0	24.6	46.7	0.6	25.5	53.3	0.7	32.2	46.7	0.6	37.8	53.3	0.7	26.1	53.3	0.7
tomato	35.4	62.0	0.8	42.7	60.0	0.8	51.6	60.0	0.8	46.7	60.0	0.8	38.9	59.5	0.8	44.5	60.0	0.8
other fruiting veg	43.5	60.0	0.8	44.0	47.3	0.6	44.9	44.1	0.6	45.9	64.0	0.9	46.4	60.5	0.8	44.6	50.7	0.7
legumes	11.6*	130.0*	1.7*	7.6	75.0	1.0	6.5	130.0	1.7	3.8*	45.6	0.6	5.3*	22.0	0.3	7.2	87.5	1.2
other	49.5	44.3	0.6	43.2	36.0	0.5	37.4	43.3	0.6	30.1	26.4*	0.4*	31.7	35.0*	0.5*	40.0	41.2	0.5

Source: 1995 National Nutrition Survey, NSW tables 1998

** RSE 25-50%*

Table 2A.2. Consumers of different types of vegetable and fruits, by age categories children and adolescents, 2-18 years, in NSW

	2-7 Years			8-11 Years			12-18 Years		
Food subtype	**%**	**g**	**Serves**	**%**	**g**	**Serves**	**%**	**g**	**Serves**
Males		***N=127***			***N=74***			***N=100***	
Fruit	**63.0**			**56.3**			**48.0**		
pomme	34.6	131.7	0.9	30.5	140.0	0.9	28.6	148.7	1.0
citrus	16.3*	86.0	0.6	11.1*	131.0	0.9	13.0*	146.8	1.0
stone	8.0*	154.2	1.0	7.1*	116.0	0.8		176.0*	1.2*
tropical	20.5*	101.9	0.7	22.1*	96.0	0.6	14.0*	91.9	0.6
dried fruit		39.8	0.3		5.6	0.0		9.07*	0.1*
melons and grapes		73.0	0.5	4.9*	85.5	0.6	13.0*	97.6	0.7
Vegetables	**68.5**			**78.0**			**80.0**		
potatoes	40.2	123.5	1.6	50.6	127.0	1.7	52.0	176.1	2.3
brassicae	7.9*	51.0*	0.7*	14.0*	78.0*	0.5*	15.0*	108.3*	0.7*
carrot	22.0*	23.2	0.3	31.1	53.8	0.4	28.0	44.0	0.3
leaf & stalk	15.7*	17.2	0.2	28.4	25.3	0.2	35.0	25.9	0.2
peas &beans	18.9*	31.8	0.4	26.6	40.0	0.3	22.0	77.3	0.5
tomato	15.7*	26.4	0.4	18.6*	45.5	0.3	19.0*	71.1	0.5
other fruiting veg	16.5*	24.5	0.3	18.7*	32.0	0.2	26.0	96.2	0.6
legumes	10.2*	77.7	1.0		86.7	0.6	11.0	106.5*	0.7*
other	19.7*	27.1	0.4	24.7*	43.3	0.3	22.0*	36.3	0.2
Females		***N=116***			***N=68***			***N=94***	
Fruit	**72.4**			**63.3**			**51.1**		
pomme	36.2	97.9	0.7	24.8	140.0	0.9	26.6*	202.5	1.4
citrus	18.1*	86.0	0.6	8.9*	131.0*	0.9*	12.8*	136.4	0.9
stone	6.9*	97.0*	0.6*	7.5*	132.0*	0.9*	10.6*	145.0*	1.0*
tropical	32.0	82.3	0.5	22.8*	96.0*	0.6*		91.7*	0.6*
dried fruit	9.5**	17.0*	0.1*					40.3*	0.3*
melons and grapes	12.1*	85.0*	0.6*	11.5	85.5*	0.6*	7.4*	279*	0.8
Vegetables	**82.8**			**72.5**			**87.2**		
potatoes	50.9	71.9	1.0	46.0	140.0	1.9	44.7	164.0	2.2
brassicae	12.9*	30.1*	0.4*	7.3*	51.0*	0.7*	11.7*	65.1*	0.9*
carrot	34.5	21.4	0.3	33.4	48.0	0.6	26.6	36.6	0.5
leaf & stalk	18.1*	13.7	0.2	21.5*	19.3	0.3	34.0	20.0	0.3
peas &beans	29.3	19.0	0.3	21.8*	62.5	0.8	20.2*	40.0	0.5
tomato	19.8*	37.3	0.5	19.6*	45.0	0.6	32.0	35.0	0.5
other fruiting veg	17.2*	22.8	0.3	22.0*	42.5	0.6	33.0	34.8	0.5
legumes								119.0*	1.6*
other	19.8*	13.8*	0.2*	11.4*	55.0*	0.7*	37.8	54.8	0.7

Source: 1995 National Nutrition Survey, NSW tables 1998

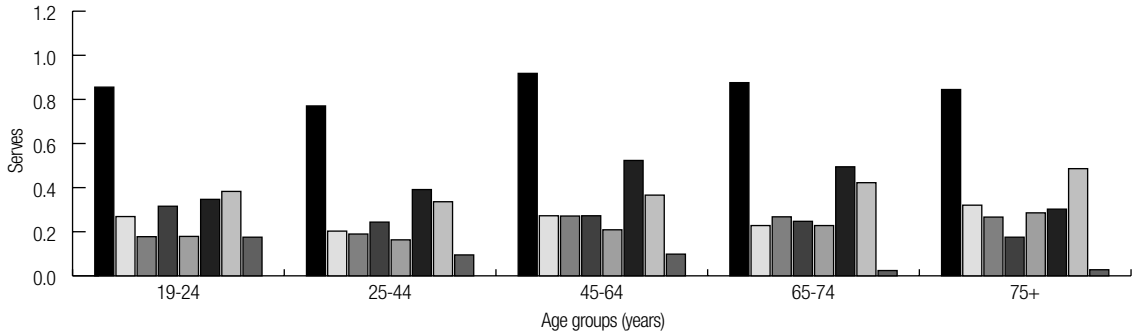
** RSE 25-50%*

Appendix 2B

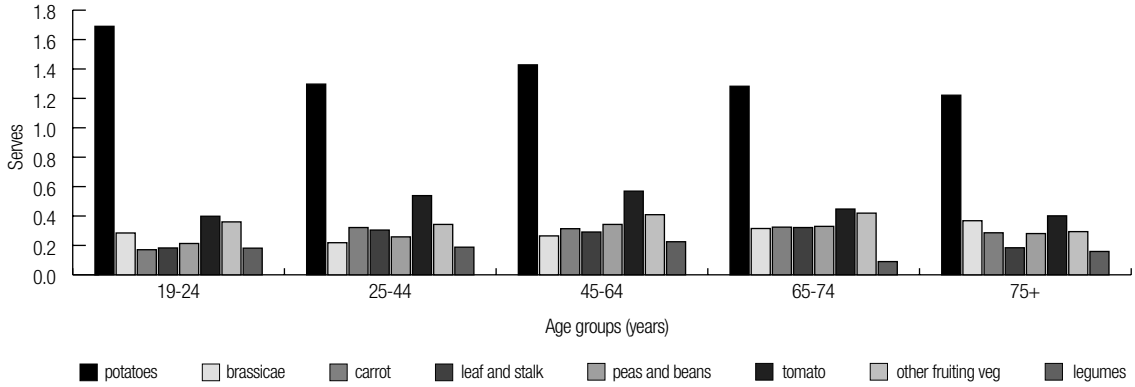
Mean serves of vegetables and fruit, based on per capita data from the 1995 NNS, NSW sub sample

Mean serves of vegetables, based on per capita data from the 1995 NNS, NSW sub-sample

A2B.1. Female

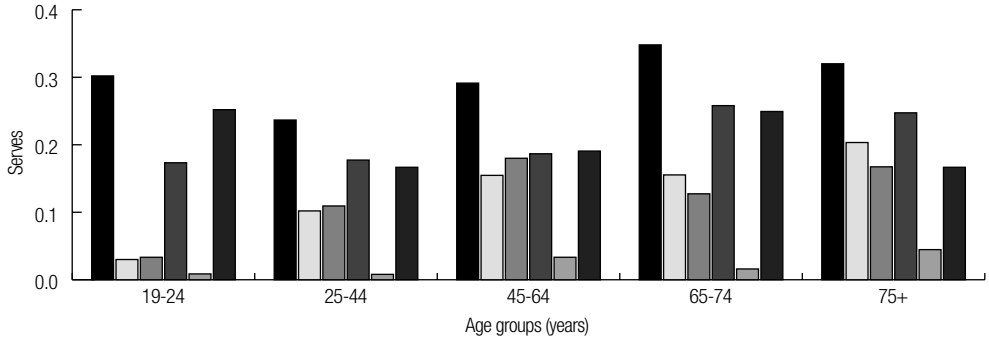


A2B.2. Male

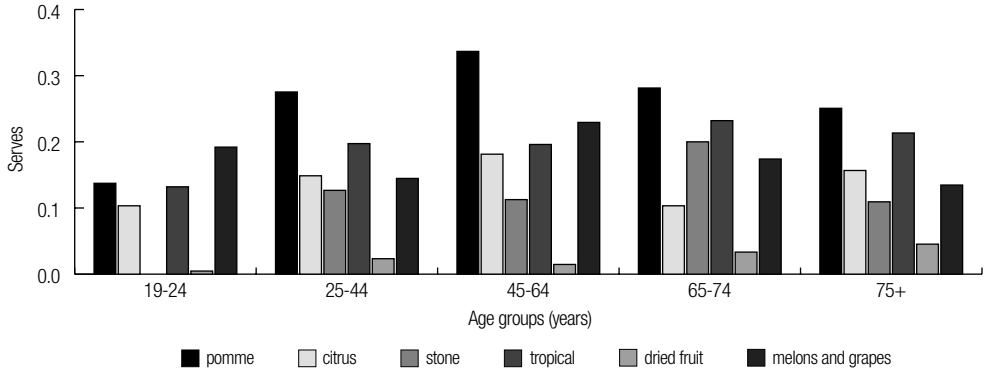


Mean serves of fruit, based on per capita data from the 1995 NNS, NSW sub-sample

A2B.3. Female



A2B.4. Male



Appendix 3A

Proportion of adults 18 yrs and over, by usual number of serves of vegetables and fruit: NSW Health Survey 1997/1998

Table 3A.1. Proportion of adults 18 yrs and over, by usual number of serves of vegetables: NSW Health Survey 1997/1998

	Male %	Female %
<1 serve	8.0	5.3
1 serve	34.4	25.9
2 serves	28.5	29.4
3 serves	12.2	18.2
4 serves	9.2	12.0
≥ 5 serves	7.7	9.2

Source: NSW Health 1997/1998

Table 3A.2. Proportion of adults 18 yrs and over, by usual number of serves of fruit: NSW Health Survey 1997/1998

	Male %	Female %
<1 serve	25.5	15.8
1 serve	35.0	32.6
2 serves	22.4	28.6
3 serves	9.8	16.1
4 serves	4.0	4.5
≥ 5 serves	3.3	2.5

Source: NSW Health 1997/1998

Appendix 3B

Vegetable and fruit consumption by Area Health Service. NSW Health Survey 1997/1998

Tables 3B. 1-34 Area Health Service data

Proportion of adults consuming serves of vegetables and fruit (separate tables), by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998.

Tables 1 and **2**	Central Coast
Tables 3 and **4**	Central Sydney
Tables 5 and **6**	Far West
Tables 7 and **8**	Greater Murray
Tables 9 and **10**	Hunter
Tables 11 and **12**	Illawarra
Tables 13 and **14**	Macquarie
Tables 15 and **16**	Mid North Coast
Tables 17 and **18**	Mid Western
Tables 19 and **20**	New England
Tables 21 and **22**	Northern Rivers
Tables 23 and **24**	Northern Sydney
Tables 25 and **26**	South East Sydney
Tables 27 and **28**	South West Sydney
Tables 29 and **30**	Southern
Tables 31 and **32**	Wentworth
Tables 33 and **34**	Western Sydney

Table 3B.1. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Central Coast Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	811	7	37	29	11	8	7	2.1	2.0
18-24	52	12	40	21	14	5	8	1.9	1.5
25-34	106	12	48	24	4	5	7	1.8	1.0
35-44	189	5	42	34	13	3	3	1.9	2.0
45-54	134	7	36	30	9	10	7	2.3	2.0
55-64	122	5	35	30	14	10	6	2.2	2.0
65-74	126	4	25	30	21	11	8	2.4	2.0
75+	67	0	25	37	6	19	13	2.6	2.0
Females									
All	1,201	4	26	32	18	11	8	2.4	2.0
18-24	75	7	37	41	11	2	2	1.8 ↓	2.0
25-34	192	6	31	27	20	8	8	2.2	2.0
35-44	256	4	28	32	17	13	5	2.4	2.0
45-54	160	2	23	31	17	17	10	2.6	2.0
55-64	171	4	24	28	15	19	11	2.6	2.0
65-74	196	4	16	34	24	11	10	2.7	2.0
75+	134	4	24	38	17	9	8	2.4	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW[/h8]

Table 3B.2. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Central Coast Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	811	29	34	22	8	7	1.4	1.0
18-24	52	26	35	23	12	5	1.5	1.0
25-34	106	29	48	12	5	5	1.3	1.0
35-44	189	35	33	21	6	5	1.3	1.0
45-54	134	36	23	19	9	13	1.7	1.0
55-64	122	28	36	21	6	9	1.5	1.0
65-74	126	16	34	34	10	5	1.6	1.5
75+	67	21	25	30	14	10	1.9	2.0
Females								
All	1,201	17	31	29	16	7	1.7	2.0
18-24	75	24	32	27	10	6	1.5	1.0
25-34	192	23	35	24	13	5	1.5	1.0
35-44	256	20	33	27	13	7	1.7	1.0
45-54	160	20	32	26	16	7	1.7	1.5
55-64	171	15	28	31	19	6	1.8	2.0
65-74	196	9	25	35	22	8	2.0	2.0
75+	134	7	28	34	20	11	2.1	2.0

1 RSE of mean all <16%

No significant differences between mean NSW age categories' intakes in this AHS

Table 3B.3. Proportion of adults consuming serves of vegetables, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Central Sydney Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	955	14	32	30	10	7	6	2.0	2.0
18-24	75	21	28	21	13	11	6	2.3	2.0
25-34	203	16	37	30	9	4	5	1.8 ↓	1.7
35-44	240	11	30	38	9	6	6	2.0 ↓	2.0
45-54	171	9	33	29	11	13	5	2.2 ↓	2.0
55-64	104	14	35	26	10	6	9	2.0 ↓	2.0
65-74	88	15	26	32	14	9	5	2.1 ↓	2.0
75+	42	20	26	35	5	9	5	2.0	2.0
Females									
All	1,273	8	30	31	15	10	6	2.2	2.0
18-24	118	10	28	29	17	13	3	2.1	2.0
25-34	297	8	33	31	16	8	4	2.0 ↓	2.0
35-44	279	6	26	34	14	11	10	2.4	2.0
45-54	208	7	30	27	19	10	7	2.3 ↓	2.0
55-64	126	10	33	29	8	10	11	2.3 ↓	2.0
65-74	120	9	34	30	12	10	5	2.1 ↓	2.0
75+	92	15	26	32	12	7	8	2.0	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age categories in this AHS compared to NSW mean[/h8]

Table 3B.4. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Central Sydney Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	955	26	34	21	10	8	1.7	1.0
18-24	75	29	29	23	11	8	1.7	1.0
25-34	203	31	34	18	11	7	1.6	1.0
35-44	240	26	35	24	9	7	1.5	1.0
45-54	171	31	33	19	12	5	1.4	1.0
55-64	104	19	34	23	8	16	1.8	1.0
65-74	88	17	39	16	13	15	1.9	1.0
75+	42	16	40	23	13	9	1.7	1.5
Females								
All	1,273	16	32	28	18	6	1.8	2.0
18-24	118	15	44	16	21	4	1.6	1.0
25-34	297	20	29	30	15	6	1.7	2.0
35-44	279	17	34	24	18	7	1.7	1.5
45-54	208	12	31	34	19	4	1.8	2.0
55-64	126	8	24	34	25	9	2.1	2.0
65-74	120	17	36	24	16	7	1.7 ↓	1.5
75+	92	21	26	42	7	4	1.6 ↓	2.0

1 RSE of mean all <16%

↓ significantly lower in this AHS compared to NSW mean, for age categories

Table 3B.5. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/98

Far West Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	779	7	24	28	13	11	17	2.9	2.0
18-24	62	15	27	32	10	5	11	2.3	2.0
25-34	154	5	31	25	13	8	17	2.7 ↑	2.0
35-44	171	10	24	24	12	13	16	2.9 ↑	2.0
45-54	149	6	23	31	11	11	18	2.9 ↑	2.0
55-64	119	1	20	26	20	14	19	3.5 ↑	3.0
65-74	92	9	15	36	11	13	16	3.0	2.0
75+	21	0	18	24	17	8	33	3.6 ↑	3.0
Females									
All	1,193	5	21	24	18	12	19	3.0	2.5
18-24	99	11	24	26	9	11	19	2.8 ↑	2.0
25-34	226	6	28	29	16	5	16	2.7 ↑	2.0
35-44	270	5	22	23	19	14	17	3.2 ↑	3.0
45-54	200	4	20	21	25	11	20	3.1 ↑	3.0
55-64	161	4	14	16	24	14	28	3.5 ↑	3.0
65-74	122	3	19	22	19	17	18	3.3 ↑	3.0
75+	85	2	18	34	11	23	13	2.9 ↑	2.5

1 RSE of mean all <16%

↑ significantly higher mean for this AHS compared to NSW mean, by age category

Table 3B.6. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Far West Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	779	37	30	16	11	6	1.4	1.0
18-24	62	41	31	9	14	5	1.3	1.0
25-34	154	49	28	13	7	3	1.1 ↓	1.0
35-44	171	39	33	13	10	5	1.3	1.0
45-54	149	38	25	21	12	5	1.4	2.0
55-64	119	29	26	25	12	9	1.6	2.0
65-74	92	29	33	15	11	12	1.6	2.0
75+	21	6	45	24	18	6	1.9*	1.0
Females								
All	1,193	20	35	23	13	9	1.7	1.0
18-24	99	22	32	27	11	8	1.7	1.0
25-34	226	25	40	19	8	7	1.4	1.0
35-44	270	25	37	20	9	8	1.5	1.0
45-54	200	19	27	27	16	10	1.9	2.0
55-64	161	16	31	25	17	11	1.9	2.0
65-74	122	11	34	23	21	10	2.0	2.0
75+	85	9	38	29	11	13	2.0	2.0

** RSE of mean 16-33%*

↓ significantly lower mean in this AHS compared to NSW mean for age category

Table 3B.7. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Greater Murray Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	852	7	38	28	9	11	7	2.1	2.0
18-24	71	14	47	22	4	5	8	1.7	1.0
25-34	153	8	44	25	11	5	7	2.0	1.5
35-44	189	6	37	33	10	12	3	2.0	2.0
45-54	145	3	30	33	7	18	8	2.5	2.0
55-64	113	6	36	25	11	12	10	2.3	2.0
65-74	111	8	37	25	10	9	11	2.3	2.0
75+	51	4	25	34	13	19	5	2.4	2.0
Females									
All	1,150	5	26	30	19	12	8	2.4	2.0
18-24	97	8	34	31	10	9	7	2.2	2.0
25-34	222	7	34	33	14	8	6	2.1	2.0
35-44	261	3	26	28	21	13	10	2.6	2.0
45-54	154	4	25	29	19	15	9	2.5	2.0
55-64	156	4	16	30	25	15	9	2.8	2.9
65-74	155	3	22	32	19	13	11	2.7	2.0
75+	76	7	23	31	28	8	2	2.2	2.0

1 RSE of mean all <16%.

No significant differences between mean intake by age categories in AHS and NSW mean

Table 3B.8. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Greater Murray Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	852	30	36	22	7	5	1.3	1.0
18-24	71	32	37	25	1	5	1.2 ↓	1.0
25-34	153	36	34	18	5	7	1.3	1.0
35-44	189	32	40	19	6	4	1.2Ø	1.0
45-54	145	32	27	27	10	4	1.3	1.0
55-64	113	25	45	19	5	7	1.4	1.0
65-74	111	27	36	21	15	1	1.4 ↓	1.0
75+	51	15	35	32	12	6	1.7	1.0
Females								
All	1,150	17	36	28	14	5	1.6	1.0
18-24	97	19	52	17	8	3	1.3 ↓	1.0
25-34	222	21	42	24	8	5	1.4 ↓	1.0
35-44	261	18	34	28	17	3	1.6	1.0
45-54	154	13	35	29	19	5	1.8	2.0
55-64	156	16	30	30	16	7	1.8	2.0
65-74	155	10	30	37	19	3	1.8	2.0
75+	76	16	25	38	14	7	1.9	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.9. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Hunter Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	802	9	31	25	13	10	12	2.5	2.0
18-24	76	14	34	18	15	8	11	2.5	2.0
25-34	135	10	32	23	16	9	10	2.3	2.0
35-44	168	11	33	25	12	8	10	2.5	2.0
45-54	153	7	30	29	12	8	14	2.6	2.0
55-64	101	4	34	23	9	15	15	3.0	2.0
65-74	101	3	29	33	20	8	7	2.4	2.0
75+	44	1	18	30	11	22	17	3.2 ↑	3.0
Females									
All	1,060	5	23	27	18	15	12	2.7	2.0
18-24	88	5	27	25	21	9	13	2.6 ↑	2.0
25-34	178	8	27	29	12	12	11	2.5	2.0
35-44	216	6	25	25	14	20	11	2.7	2.0
45-54	185	4	16	24	25	18	13	2.9	3.0
55-64	151	3	21	28	18	15	15	2.9	2.5
65-74	138	2	19	24	22	18	14	3.0	3.0
75+	80	3	23	33	17	14	10	2.7	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.10. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Hunter Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	802	28	32	23	9	7	1.6	1.0
18-24	76	29	31	26	9	5	1.6	1.0
25-34	135	37	34	21	4	4	1.1 ↓	1.0
35-44	168	25	33	21	11	10	1.7	1.0
45-54	153	30	31	19	12	8	1.5	1.0
55-64	101	26	28	33	8	6	1.7	1.0
65-74	101	23	32	25	13	6	1.6	1.0
75+	44	10	41	20	11	18	2.0	2.0
Females								
All	1,060	21	34	28	12	6	1.6	1.0
18-24	88	18	51	18	8	6	1.4	1.0
25-34	178	27	40	22	8	3	1.3 ↓	1.0
35-44	216	26	34	29	8	3	1.3 ↓	1.0
45-54	185	26	24	32	13	5	1.6	1.5
55-64	151	17	29	30	15	9	1.8	2.0
65-74	138	9	27	34	21	9	2.1	2.0
75+	80	10	34	31	14	11	1.9	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.11. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/98

Illawarra Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	864	6	32	26	12	10	13	2.5	2.0
18-24	58	6	43	26	5	11	8	2.2	2.0
25-34	133	11	34	24	11	8	13	2.7	2.0
35-44	204	6	35	29	11	8	10	2.3	2.0
45-54	141	1	29	24	20	6	18	2.9 ↑	2.0
55-64	119	6	29	27	11	10	18	2.8	2.0
65-74	134	5	26	27	12	14	16	2.7	2.0
75+	58	4	21	25	22	22	6	2.7	3.0
Females									
All	1,166	4	22	25	22	15	13	2.8	2.5
18-24	91	10	34	22	18	6	10	2.2	2.0
25-34	213	2	28	29	19	10	11	2.6	2.0
35-44	249	4	21	26	25	15	10	2.8	2.5
45-54	182	4	19	25	20	17	15	2.9	3.0
55-64	164	2	13	24	27	18	16	3.2	3.0
65-74	165	3	17	19	27	20	15	3.1 ↑	3.0
75+	78	3	18	25	21	20	12	2.9 ↑	3.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.12. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Illawarra Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	864	29	30	23	10	9	1.6	1.0
18-24	58	37	27	16	15	5	1.5	1.0
25-34	133	35	24	25	8	8	1.4	1.0
35-44	204	29	31	23	9	7	1.4	1.0
45-54	141	24	23	23	11	18	1.9	2.0
55-64	119	28	31	20	11	9	1.6	1.0
65-74	134	21	37	30	9	3	1.4	1.0
75+	58	14	51	19	10	7	1.5	1.0
Females								
All	1166	17	28	31	17	7	1.8	1.0
18-24	91	19	31	28	16	5	1.7	1.4
25-34	213	17	34	28	14	8	1.8	1.5
35-44	249	20	32	30	12	6	1.6	1.0
45-54	182	16	26	31	18	9	1.9	2.0
55-64	164	19	29	24	22	6	1.8	2.0
65-74	165	12	17	40	23	8	2.1	2.0
75+	78	14	22	43	16	5	1.8	2.0

1 RSE of mean all <16%

No significant differences between mean intake for AHS and NSW

Table 3B.13. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Macquarie Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	846	5	36	27	14	13	5	2.2	2.0
18-24	61	4	46	20	8	18	4	2.3	1.5
25-34	139	7	42	24	11	10	6	2.0	2.0
35-44	215	7	33	30	13	10	7	2.2	2.0
45-54	149	2	40	29	13	13	2	2.1 ↓	2.0
55-64	114	3	29	31	17	12	7	2.4	2.0
65-74	92	3	24	26	25	14	7	2.6	2.0
75+	43	3	32	30	15	16	4	2.3	2.0
Females									
All	1,146	3	24	29	20	13	10	2.6	2.0
18-24	78	3	44	30	14	3	6	2.0	2.0
25-34	218	4	25	31	22	11	6	2.4	2.0
35-44	243	2	26	31	18	13	11	2.7	2.0
45-54	210	2	24	25	21	14	13	2.8	2.5
55-64	163	2	13	28	23	14	20	3.2	3.0
65-74	117	5	18	29	23	18	7	2.6	2.5
75+	89	2	19	30	23	17	10	2.7	2.5

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.14. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Macquarie Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	846	34	33	22	7	5	1.3	1.0
18-24	61	37	30	22	5	6	1.3	1.0
25-34	139	41	24	24	6	6	1.3	1.0
35-44	215	30	41	21	5	3	1.3	1.0
45-54	149	39	30	17	7	7	1.3	1.0
55-64	114	35	28	26	5	5	1.3 ↓	1.0
65-74	92	20	43	17	14	6	1.6	1.0
75+	43	26	35	27	7	5	1.4	1.0
Females								
All	1,146	20	33	26	14	7	1.7	1.0
18-24	78	31	32	20	10	6	1.4	1.0
25-34	218	27	27	32	9	6	1.5	1.0
35-44	243	21	36	22	14	6	1.6	1.0
45-54	210	18	34	22	20	7	1.8	1.0
55-64	163	15	26	30	16	14	2.1	2.0
65-74	117	12	37	28	15	8	1.8	2.0
75+	89	6	40	28	21	5	1.9	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.15. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Mid North Coast Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	842	4	29	30	14	12	11	2.5	2.0
18-24	52	12	40	20	14	9	5	2.0	1.4
25-34	83	8	34	32	14	6	5	2.1	2.0
35-44	155	2	24	36	11	15	11	2.8 ↑	2.0
45-54	155	3	34	26	12	11	13	2.5	2.0
55-64	143	3	26	25	14	18	14	2.8 ↑	2.0
65-74	149	1	24	35	18	11	11	2.7	2.0
75+	75	4	22	32	17	14	12	2.8	2.0
Females									
All	1,192	3	20	26	21	15	14	2.9	2.5
18-24	53	8	34	26	11	8	12	2.4	2.0
25-34	148	4	21	29	23	14	9	2.7 ↑	2.0
35-44	258	2	24	27	17	18	12	2.9 ↑	2.5
45-54	199	2	18	27	20	17	17	3.1 ↑	3.0
55-64	190	2	16	21	31	13	18	3.2	3.0
65-74	198	3	13	24	22	20	18	3.2 ↑	3.0
75+	114	5	21	33	21	11	9	2.6	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.16. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Mid North Coast Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	842	21	36	23	10	10	1.7	1.0
18-24	52	20	47	19	11	3	1.5	1.0
25-34	83	24	42	18	8	8	1.5	1.0
35-44	155	26	33	20	8	13	1.8	1.0
45-54	155	22	30	22	13	13	1.9	1.0
55-64	143	20	38	21	9	12	1.7	1.0
65-74	149	15	30	34	15	7	1.8	2.0
75+	75	13	44	34	5	4	1.5	1.0
Females								
All	1,192	13	28	30	19	10	2.0	2.0
18-24	53	14	31	26	25	3	1.8	2.0
25-34	148	24	28	31	12	5	1.6	1.0
35-44	258	15	30	27	18	10	1.9 ↑	2.0
45-54	199	13	35	27	12	13	2.0	2.0
55-64	190	10	23	28	22	17	2.3 ↑	2.0
65-74	198	8	28	29	25	10	2.1	2.0
75+	114	8	22	42	21	7	2.0	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.17. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Mid Western Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	812	5	36	31	13	8	6	2.1	2.0
18-24	65	13	39	21	15	8	4	1.9	1.5
25-34	125	5	39	29	13	6	7	2.1	2.0
35-44	170	3	37	37	12	8	3	2.0	2.0
45-54	146	9	33	33	14	5	6	2.1	2.0
55-64	137	2	30	33	14	13	8	2.4	2.0
65-74	95	1	36	36	12	7	8	2.3	2.0
75+	40	3	42	28	12	8	7	2.1	2.0
Females									
All	1,251	4	28	29	19	12	8	2.4	2.0
18-24	108	9	37	34	9	8	4	1.9	2.0
25-34	240	4	31	38	15	8	5	2.2	2.0
35-44	281	3	30	28	20	12	8	2.4	2.0
45-54	200	3	25	26	22	14	11	2.7	2.0
55-64	173	4	20	20	28	16	13	2.9	3.0
65-74	133	2	23	25	22	20	8	2.7	3.0
75+	82	1	29	31	24	12	3	2.3	2.0

1 RSE of mean all <16%

No significant differences between mean intake by age categories in AHS and NSW

Table 3B.18. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Mid Western Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	812	27	37	23	8	5	1.4	1.0
18-24	65	32	35	22	4	7	1.5 ↓	1.0
25-34	125	30	39	19	6	6	1.3	1.0
35-44	170	30	28	29	9	3	1.4	1.0
45-54	146	27	38	20	11	4	1.4	1.0
55-64	137	21	38	25	8	8	1.5	1.0
65-74	95	22	40	28	5	4	1.4	1.0
75+	40	12	53	21	9	5	1.5	1.0
Females								
All	1,251	18	34	29	13	6	1.7	1.0
18-24	108	24	39	25	6	6	1.5	1.0
25-34	240	20	39	24	12	5	1.5	1.0
35-44	281	16	33	29	15	6	1.7	1.5
45-54	200	19	27	30	15	8	1.8	2.0
55-64	173	17	31	31	16	6	1.7 ↓	2.0
65-74	133	16	35	32	11	5	1.6 ↓	1.5
75+	82	9	30	37	16	9	1.9	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.19. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

New England Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	826	5	35	29	12	10	8	2.2	2.0
18-24	68	9	38	31	9	8	5	2.0	2.0
25-34	141	5	40	33	10	8	5	1.9	2.0
35-44	197	6	40	26	14	8	6	2.1	2.0
45-54	169	5	32	29	14	12	8	2.3	2.0
55-64	105	5	28	26	11	13	16	2.7	2.0
65-74	89	3	33	21	18	17	8	2.5	2.0
75+	39	1	33	42	6	13	5	2.2	2.0
Females									
All	1,195	4	24	27	19	16	10	2.6	2.0
18-24	93	4	33	33	13	10	7	2.3	2.0
25-34	208	5	30	26	21	10	8	2.4	2.0
35-44	269	3	20	32	20	15	10	2.6	2.0
45-54	214	4	19	20	22	23	13	3.0 ↑	3.0
55-64	154	4	18	27	19	19	14	2.9	3.0
65-74	140	4	22	26	20	18	11	2.7	2.5
75+	86	1	36	31	14	16	3	2.2	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.20. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

New England Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	826	29	40	17	9	7	1.4	1.0
18-24	68	30	38	15	11	7	1.3	1.0
25-34	141	41	36	15	2	6	1.1 ↓	1.0
35-44	197	31	35	17	10	7	1.4	1.0
45-54	169	24	38	16	12	10	1.8	1.0
55-64	105	27	35	22	11	5	1.5	1.0
65-74	89	21	45	22	10	1	1.3 ↓	1.0
75+	39	19	47	17	7	10	1.4	1.0
Females								
All	1,195	18	35	26	13	7	1.7	1.0
18-24	93	19	50	14	12	5	1.4	1.0
25-34	208	21	43	20	10	6	1.5	1.0
35-44	269	21	37	23	12	7	1.6	1.0
45-54	214	17	28	31	13	10	1.9	2.0
55-64	154	12	31	36	13	7	1.8	2.0
65-74	140	14	21	34	24	8	2.0	2.0
75+	86	18	36	29	15	2	1.5 ↓	1.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.21. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Northern Rivers Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	812	5	30	28	15	11	11	2.6	2.0
18-24	49	7	29	31	15	10	8	2.4	2.0
25-34	97	8	29	28	23	7	5	2.2	2.0
35-44	163	3	37	28	16	9	7	2.3	2.0
45-54	161	2	34	24	10	9	21	2.9 ↑	2.0
55-64	107	5	28	30	15	11	12	2.5	2.0
65-74	125	4	22	28	17	16	12	2.8	2.5
75+	78	5	18	34	10	20	14	2.9	2.0
Females									
All	1,161	4	22	28	20	15	11	2.7	2.0
18-24	60	6	30	20	22	12	9	2.5	2.0
25-34	175	4	31	26	18	10	10	2.5	2.0
35-44	263	4	23	31	22	12	8	2.5	2.0
45-54	201	3	19	27	19	21	10	2.8	2.5
55-64	160	2	14	27	25	16	16	3.1	3.0
65-74	170	3	14	30	20	18	16	3.1 ↑	3.0
75+	104	5	25	29	13	12	16	2.8 ↑	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.22. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Northern Rivers Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	812	21	32	26	13	9	1.8	1.0
18-24	49	26	28	24	16	6	1.9*	1.0
25-34	97	29	38	16	11	6	1.4	1.0
35-44	163	21	35	27	9	8	1.6	1.0
45-54	161	23	28	25	13	12	2.0 ↑	1.0
55-64	107	22	32	25	10	10	1.8	1.0
65-74	125	15	24	32	20	10	2.0 ↑	2.0
75+	78	7	37	38	13	5	2.0	2.0
Females								
All	1,161	15	27	29	18	10	2.0	2.0
18-24	60	19	27	28	18	9	1.8	2.0
25-34	175	21	32	30	9	8	1.7	1.5
35-44	263	16	32	24	18	10	1.9 ↑	2.0
45-54	201	15	19	28	23	15	2.2 ↑	2.0
55-64	160	11	25	28	25	10	2.1 ↑	2.0
65-74	170	11	25	37	18	9	2.0 ↑	2.0
75+	104	10	28	36	16	10	2.1 ↑	2.0

** RSE of mean 16-33%*

↑ significantly higher mean for age category in AHS compared to NSW[/h8]

Table 3B.23. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Northern Sydney Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	843	8	34	31	14	8	5	2.1	2.0
18-24	77	11	24	32	12	10	11	2.3	2.0
25-34	121	11	35	33	14	4	3	1.9	2.0
35-44	196	7	39	32	13	7	2	1.9	2.0
45-54	140	7	40	26	15	8	4	2.0 ↓	2.0
55-64	113	5	32	36	12	12	4	2.2	2.0
65-74	108	3	32	22	20	13	8	3.0*	2.0
75+	60	5	29	45	9	9	3	2.0 ↓	2.0
Females									
All	1,170	3	25	32	18	12	9	2.2	2.0
18-24	69	3	24	43	14	6	9	2.4	2.0
25-34	197	2	34	33	15	9	6	2.2	2.0
35-44	238	3	27	30	22	10	8	2.5	2.0
45-54	200	5	20	29	21	15	9	2.7	2.0
55-64	160	2	12	38	18	16	14	2.9	2.5
65-74	167	5	21	31	20	17	6	2.6	2.0
75+	119	4	33	22	19	12	9	2.5	2.0

* *RSE of mean 16-33%*

↓ *significantly lower mean for age category in this AHS compared to NSW[/h8]*

Table 3B.24. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Northern Sydney Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	843	25	35	23	9	7	1.5	1.0
18-24	77	19	34	24	12	11	1.7	1.0
25-34	121	29	36	20	10	5	1.4	1.0
35-44	196	32	35	22	5	6	1.4	1.0
45-54	140	30	30	19	13	8	1.6	1.0
55-64	113	20	41	30	4	5	1.5	1.0
65-74	108	13	37	28	16	6	1.8	2.0
75+	60	16	41	24	9	9	1.6	1.0
Females								
All	1,170	10	33	30	18	8	1.9	2.0
18-24	69	9	43	25	9	14	1.9	1.5
25-34	197	12	42	26	13	7	1.7	1.0
35-44	238	13	36	31	15	6	1.7	2.0
45-54	200	9	28	27	26	9	2.1 ↑	2.0
55-64	160	11	26	33	21	8	2.0	2.0
65-74	167	9	25	37	21	8	2.1	2.0
75+	119	5	25	37	25	8	2.2	2.0

1 RSE of mean all <16%

↑ *significantly higher mean for age category for this AHS compared to NSW*

Table 3B.25. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Southern Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	854	8	35	26	13	11	7	2.5	2.0
18-24	48	10	43	24	14	2	7	2.0	1.5
25-34	114	13	34	23	11	18	1	2.0	2.0
35-44	211	10	32	32	7	10	8	2.2	2.0
45-54	173	7	35	27	13	10	8	2.3	2.0
55-64	121	4	41	16	17	10	12	2.5	2.0
65-74	123	4	30	32	17	8	9	2.3	2.0
75+	43	1	24	24	21	18	11	2.7	2.0
Females									
All	1,150	3	25	30	21	13	8	2.5	2.0
18-24	58	7	32	38	11	9	3	2.0	2.0
25-34	160	4	29	30	20	12	6	2.3	2.0
35-44	258	1	20	35	22	13	8	2.6	2.0
45-54	210	3	28	22	19	14	14	2.7	2.0
55-64	152	4	19	30	23	19	5	2.7	2.5
65-74	153	4	22	21	26	17	11	2.7	3.0
75+	76	3	30	32	22	7	7	2.4	2.0

1 RSE of mean all <16%

No significant differences between mean intake by age categories in AHS and NSW

Table 3B.26. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Southern Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	854	28	37	20	8	6	1.4	1.0
18-24	48	31	53	4	7	5	1.1 ↓	1.0
25-34	114	29	36	25	5	5	1.3	1.0
35-44	211	29	35	19	8	7	1.4	1.0
45-54	173	32	37	16	7	7	1.4	1.0
55-64	121	24	41	22	9	3	1.3 ↓	1.0
65-74	123	24	29	24	16	7	1.7	1.5
75+	43	23	29	36	7	5	1.5	1.0
Females								
All	1,100	17	33	28	16	6	1.6	1.0
18-24	58	25	33	21	12	9	1.6	1.0
25-34	160	19	38	22	17	4	1.5	1.0
35-44	258	18	37	26	16	2	1.6	1.0
45-54	210	17	36	24	13	11	1.8	1.5
55-64	152	14	26	33	20	6	1.9	2.0
65-74	153	12	27	35	19	7	1.9	2.0
75+	76	12	24	37	19	7	2.0	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.27. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

South Eastern Sydney Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	908	7	34	30	14	8	8	2.2	2.0
18-24	99	7	40	32	15	3	4	1.8	2.0
25-34	171	10	32	28	14	9	7	2.4	2.0
35-44	209	4	39	31	10	7	9	2.1	2.0
45-54	145	5	31	27	15	12	10	2.4	2.0
55-64	108	8	32	27	17	8	8	2.2	2.0
65-74	99	4	26	27	20	11	12	2.6	2.0
75+	55	6	33	42	8	8	3	2.0	2.0
Females									
All	1,119	6	24	31	18	12	9	2.5	2.0
18-24	90	6	36	27	16	9	7	2.2	2.0
25-34	208	7	24	33	17	12	6	2.3	2.0
35-44	249	3	16	39	20	12	10	2.7	2.0
45-54	171	7	19	36	13	13	13	2.6	2.0
55-64	137	3	22	24	19	17	15	3.1	3.0
65-74	131	6	24	21	27	11	10	2.7	2.5
75+	108	13	32	25	19	7	3	1.9 ↓	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.28. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

South Eastern Sydney Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	908	20	39	22	11	8	1.7	1.0
18-24	99	15	38	24	14	10	1.8	1.0
25-34	171	23	43	16	12	7	1.6	1.0
35-44	209	24	38	23	8	6	1.5	1.0
45-54	145	23	37	20	12	9	1.7	1.0
55-64	108	16	40	28	7	9	1.7	1.0
65-74	99	19	33	24	14	10	1.9	1.0
75+	55	14	44	26	9	7	1.6	1.0
Females								
All	1,119	14	32	31	17	6	1.8	1.0
18-24	90	13	45	25	13	5	1.6	1.0
25-34	208	18	31	33	13	5	1.7	2.0
35-44	249	11	36	30	18	5	1.8	2.0
45-54	171	15	28	30	18	9	1.9	2.0
55-64	137	12	23	32	23	9	2.1	2.0
65-74	131	9	27	36	19	8	2.0	2.0
75+	108	11	29	34	21	4	1.8	2.0

1 RSE of mean all <16%

No significant differences between mean age categories for AHS and NSW

Table 3B.29. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

South Western Sydney Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	886	9	40	28	9	8	5	2.0	2.0
18-24	104	14	47	19	8	10	2	1.6 ↓	1.0
25-34	161	12	40	28	6	9	4	1.8	1.1
35-44	225	6	38	35	9	7	5	2.0	2.0
45-54	157	5	36	29	11	10	8	2.3	2.0
55-64	114	9	37	27	13	10	4	2.0 ↓	2.0
65-74	62	10	39	22	13	3	13	2.4	2.0
75+	30	1	49	29	2	14	4	2.0	1.7
Females									
All	1,143	7	32	30	17	8	6	2.2	2.0
18-24	98	10	45	30	7	3	5	1.8 ↓	1.0
25-34	253	7	37	30	14	6	6	2.1	2.0
35-44	299	8	31	29	18	10	4	2.1 ↓	2.0
45-54	167	8	22	24	24	10	12	2.6	2.0
55-64	121	4	20	36	19	11	10	2.6	2.0
65-74	106	4	30	34	20	9	3	2.2 ↓	2.0
75+	62	4	33	29	16	14	3	2.3	2.0

1 RSE of mean all <16%

↓ *significantly lower mean for age category in this AHS compared to NSW*

Table 3B.30. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

South Western Sydney Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	886	26	35	24	10	6	1.5	1.0
18-24	104	27	39	26	5	4	1.4	1.0
25-34	161	30	33	19	13	6	1.5	1.0
35-44	225	26	38	22	8	6	1.5	1.0
45-54	157	27	33	27	10	3	1.5	1.0
55-64	114	20	31	20	17	11	1.8	1.5
65-74	62	24	39	31	2	4	1.4	1.0
75+	30	17	23	27	24	9	1.9	2.0
Females								
All	1,143	19	32	27	16	6	1.7	1.0
18-24	98	18	44	17	10	11	1.6	1.0
25-34	253	19	38	26	10	7	1.6	1.0
35-44	299	24	30	31	11	4	1.5 ↓	1.0
45-54	167	18	27	23	25	7	1.8	2.0
55-64	121	12	31	33	20	4	1.8	2.0
65-74	106	18	20	33	24	5	1.9	2.0
75+	62	12	31	34	17	5	1.8	2.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.31. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Wentworth Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	854	9	37	26	13	9	6	2.1	2.0
18-24	90	14	43	21	12	7	3	1.8	1.0
25-34	159	10	36	31	10	9	5	2.0	2.0
35-44	216	8	42	28	11	7	5	2.0	2.0
45-54	175	9	37	22	15	11	6	2.2	2.0
55-64	85	5	27	26	26	11	7	2.4	2.0
65-74	64	3	27	29	15	8	18	2.8	2.0
75+	31	3	36	34	11	13	2	2.1	2.0
Females									
All	1,163	6	26	28	19	10	9	2.4	2.0
18-24	82	10	32	29	16	6	6	2.2	2.0
25-34	288	7	30	31	18	6	8	2.2	2.0
35-44	286	5	29	24	21	13	8	2.4	2.0
45-54	210	4	18	30	19	14	16	2.9	2.0
55-64	123	5	21	27	22	12	12	2.6	2.0
65-74	94	6	23	28	18	17	9	2.6	2.0
75+	45	4	22	35	27	6	7	2.3	2.0

1 RSE of mean all <16%

No significant differences between mean intake by age categories in AHS and NSW

Table 3B.32. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Wentworth Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	854	27	37	20	9	6	1.4	1.0
18-24	90	26	28	14	20	11	1.8	1.0
25-34	159	31	43	17	5	4	1.3	1.0
35-44	216	30	36	22	6	6	1.4	1.0
45-54	175	30	33	23	10	4	1.5	1.0
55-64	85	24	36	22	11	7	1.6	1.0
65-74	64	13	41	24	13	9	1.7	1.4
75+	31	13	48	33	4	1	1.4	1.0
Females								
All	1,163	19	31	28	14	8	1.7	1.5
18-24	82	21	37	17	12	13	1.8	1.0
25-34	288	20	36	26	12	6	1.6	1.0
35-44	286	21	33	26	15	6	1.6	2.0
45-54	210	20	24	32	16	8	1.8	2.0
55-64	123	13	25	27	20	15	2.1	2.0
65-74	94	20	25	39	12	4	1.6 ↓	2.0
75+	45	10	28	41	15	6	1.9	1.0

1 RSE of mean all <16%

↓ significantly lower mean for age category in this AHS compared to NSW

Table 3B.33. Proportion of adults consuming serves of vegetables, by age categories and sex from the NSW Health Survey 1997/1998

Western Sydney Area Health Service

Age category	N Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	905	10	35	28	10	10	8	2.2	2.0
18-24	99	13	38	27	11	3	7	2.1*	1.5
25-34	153	12	46	28	3	4	7	1.8	1.0
35-44	215	10	31	30	11	11	8	2.3	2.0
45-54	176	8	33	30	10	11	9	2.4	2.0
55-64	108	5	28	25	17	20	5	2.5	2.0
65-74	83	10	28	25	8	20	9	2.5	2.0
75+	36	3	15	24	18	25	16	3.2 ↑	3.0
Females									
All	1,157	6	28	28	17	11	10	2.4	2.0
18-24	114	12	41	23	13	4	7	1.9	1.5
25-34	242	5	30	29	16	13	7	2.4	2.0
35-44	270	5	26	34	16	9	9	2.4	2.0
45-54	197	4	28	28	18	9	14	2.7	2.0
55-64	126	3	18	24	23	21	11	3.0	3.0
65-74	115	4	23	30	17	15	11	2.7	2.0
75+	56	6	29	26	15	15	8	2.4	2.0

* *RSE of mean 16-33%*

↑ *significantly higher mean NSW state age category and this AHS*

Table 3B.34. Proportion of adults consuming serves of fruit, by age categories and sex in Area Health Services, from the NSW Health Survey 1997/1998

Western Sydney Area Health Service

Age category	N Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	905	28	33	21	9	8	1.6	1.0
18-24	99	32	33	17	7	10	1.5	1.0
25-34	153	35	31	19	6	9	1.5	1.0
35-44	215	22	38	19	12	9	1.7	1.0
45-54	176	28	31	26	11	4	1.4	1.0
55-64	108	30	34	23	7	8	1.4	1.0
65-74	83	22	35	21	14	9	1.7	1.0
75+	36	15	25	35	14	11	2.0	2.0
Females								
All	1,157	16	35	27	16	6	1.7	1.5
18-24	114	25	40	21	10	4	1.4	1.0
25-34	242	14	39	29	10	8	1.7	1.0
35-44	270	14	35	28	17	6	1.8	2.0
45-54	197	12	35	28	21	4	1.8	2.0
55-64	126	20	27	30	20	4	1.7	2.0
65-74	115	14	29	32	19	5	1.8	2.0
75+	56	10	35	22	25	8	2.0	2.0

1 RSE of mean all <16%

No significant difference between mean intakes by age categories in AHS and NSW

Appendix 3C

Hypothetical data sets

Table 3C.1. Hypothetical example: Number of serves of vegetables usually consumed by adults, stratified by age and sex, in a metropolitan Area Health Service, NSW Health Survey 1997/98

Age category	Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean[1]	Median
Males									
All	886	9	40	28	9	8	5	2.0 ↓	2.0
18-24	104	14	47	19	8	10	2	1.6 ↓	1.0
25-34	161	12	40	28	6	9	4	1.8	1.1
35-44	225	6	38	35	9	7	5	2.0	2.0
45-54	157	5	36	29	11	10	8	2.3	2.0
55-64	114	9	37	25	13	10	6	2.2	2.0
65-74	62	10	39	22	13	3	13	2.4	2.0
75+	30	1	49	29	2	14	4	2.0	1.7
Females									
All	1,143	7	32	30	17	8	6	2.2 ↓	2.0
18-24	98	10	45	30	7	3	5	1.8 ↓	1.0
25-34	253	7	37	30	14	6	6	2.1	2.0
35-44	299	8	31	29	18	10	4	2.1 ↓	2.0
45-54	167	8	22	24	24	10	12	2.6	2.0
55-64	121	4	20	36	19	11	10	2.6	2.0
65-74	106	4	30	34	20	9	3	2.2 ↓	2.0
75+	62	4	33	29	16	14	3	2.2	2.0

1 RSE of mean all <16%

↓ mean of AHS significantly lower than NSW mean for this age category

Interpretation of the hypothetical metropolitan AHS

Vegetable consumption (Table 3C.1)

- The mean and median vegetable intake of males and females in the hypothetical metropolitan AHS was lower than the mean and median intake for NSW as a whole. This is true for nearly all age categories and for both men and women, with the differences being statistically significant in a number of cases (particularly women).
- Both young men and young women, aged 18-34 years, consumed the lowest intakes of vegetables; 61% of 18-24 year old men and 55% of 18-24 year old women consumed less than two serves of vegetables per day. The mean intake for this age group was also significantly less than that of 18-24 year olds in NSW as a whole.
- Among men in this AHS, those aged 65-74 years reported the highest vegetable consumption (one sixth of the population consumed four or more serves of vegetables per day), in accordance with data for NSW as a whole. However, although this age category represents the highest vegetable intake among men, more than 80% of this age group consumed less than the recommended number of five serves per day.
- Vegetable consumption decreased in the 75+ age group in this AHS for both men and women, although this 'drop off' was not as evident at the state level in men.
- Amongst women, older middle-aged women, aged 45-64 years, had the highest reported vegetable intake (one fifth reported consumption of four or more serves of vegetables per day). This is in accordance with the state data in which women aged 55-64 had the highest intakes of both sexes and all age groups.

Table 3C.2. Hypothetical example: Number of serves of fruit usually consumed by adults, stratified by age and sex in a metropolitan Area Health Service, NSW Health Survey 1997/1998

Age category	Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	886	26	35	24	10	6	1.5	1.0
18-24	104	27	39	26	5	4	1.4	1.0
25-34	161	30	33	19	13	6	1.5	1.0
35-44	225	25	38	23	8	6	1.5	1.0
45-54	157	25	33	29	10	3	1.5	1.0
55-64	114	20	31	20	17	11	1.8	1.5
65-74	62	24	31	31	10	4	1.8	1.5
75+	30	17	23	27	24	9	1.9	2.0
Females								
All	1,143	18	32	28	16	6	1.8	2.0
18-24	98	18	44	17	10	11	1.6	1.0
25-34	253	19	38	26	10	7	1.6	1.0
35-44	299	22	32	31	11	4	1.6	1.0
45-54	167	18	27	23	25	7	1.8	2.0
55-64	121	12	31	33	20	4	1.8	2.0
65-74	106	18	20	33	24	5	1.9	2.0
75+	62	12	31	34	17	5	1.8	2.0

1 RSE of mean all <16%.
No significant differences between mean NSW age categories and this AHS

- Mean and median number of serves of vegetables in this AHS for all age groups and both men and women were much lower than the recommended five serves of vegetables per day. Indeed, because the highest serves category of the survey was 'four or more' then many fewer people may consume five or more per day. Thus, nearly all adults, but particularly young adults in this AHS, need to increase their vegetable consumption by at least three serves per day.

Fruit consumption (Table 3C.2)

- The fruit intake of men and women in the hypothetical metropolitan AHS was not significantly different in any age category to the comparable NSW state intakes. Overall, about 40% of men and 50% of women consumed the recommended two or more serves of fruit per day.
- Generally, serves of fruit eaten by people in this AHS increased with age, ie older people ate more fruit.
- At least 50% of males aged less than 55 years consumed one serve of fruit or less per day (median = 1.0 serve).
- Many younger men, particular men aged 18-24 years and 25-34 years, consumed very low amounts of fruit (less than one serve per day).
- The median intake of fruit in older men was considerably higher than for the state overall. Particularly, men aged 75 years and over reported consuming larger amounts of fruit – up to one third consumed three or more serves per day. However, the total number of men aged over 75 years who participated in the survey was small (n=30), and so these data may not be truly representative.

Table 3C.3. Hypothetical example: Number of serves of vegetables usually consumed by adults, stratified by age and sex, in a rural Area Health Service, NSW Health Survey 1997/1998

Age category	Value	% Consuming by number of serves						Number of serves	
		<1	1<2	2<3	3<4	4<5	5+	Mean	Median
Males									
All	779	7	38	28	9	11	7	2.1	2.0
18-24	62	14	47	22	4	5	8	1.7	1.0
25-34	154	8	44	25	11	5	7	2.0	1.5
35-44	171	6	37	33	10	12	3	2.0	2.0
45-54	149	3	30	33	7	18	8	2.5	2.0
55-64	119	6	36	25	11	12	10	2.3	2.0
65-74	92	8	37	25	10	9	11	2.3	2.0
75+	21	4	25	34	13	19	5	2.4	2.0
Females									
All	1,193	5	26	30	19	12	8	2.4	2.0
18-24	99	8	34	31	10	9	7	2.2	2.0
25-34	226	7	34	33	14	8	6	2.1	2.0
35-44	270	3	26	28	21	13	10	2.6	2.0
45-54	200	4	25	29	19	15	9	2.5	2.0
55-64	161	4	16	30	25	15	9	2.8	2.9
65-74	122	3	22	32	19	13	11	2.7	2.0
75+	85	7	23	31	28	8	2	2.2	2.0

1 RSE of mean all <5%.

No significant differences between mean NSW age categories and this AHS

- Women generally consumed more fruit than men – their mean intake was 1.8 serves per day compared to 1.5 serves per day for men.
- At least 50% of females aged less than 45 years consumed only one serve of fruit or less per day (median = 1.0).
- Older women tended to consume greater amounts of fruit, as indicated by both higher mean and median intakes compared to younger women.
- At least 50% of women aged 45 years and over consumed the recommended intake of fruit (median = 2.0).
- Although fruit consumption is closer to recommended amounts than vegetable consumption, less than half the population is consuming the recommended two or more serves of fruit per day. Thus increased fruit intake of the whole population is required, with particular emphasis on the younger age groups.

Interpretation of the hypothetical rural AHS

Vegetable consumption (Table 3C.3)

- Vegetable intakes for men and women in the hypothetical rural AHS were similar to the overall state values for NSW for both sexes and most age categories.
- The major differences for vegetable intakes between this AHS and NSW as a whole is in young men aged 18-34 years. Mean intake in the 18-24 year age group in this AHS was 1.7 compared to 2.0 in NSW. The median intakes were 1.0 and 1.5 for the 18-24 and 25-34 year groups respectively. These values are much lower than those for NSW, where the median intake per day for both age groups was 2.0. However, these differences are not significant.
- Women aged 55-64 years in this AHS consumed a particularly large amount of vegetables compared

Table 3C.4. Hypothetical example: Number of serves of fruit usually consumed by adults, stratified by age and sex, in a rural Area Health Services, NSW Health Survey 1997/1998

Age category	Value	% Consuming by number of serves					Number of serves	
		<1	1<2	2<3	3<4	4+	Mean[1]	Median
Males								
All	779	37	30	16	11	6	1.4 ↓	1.0
All	62	41	31	9	14	5	1.3	1.0
18-24	154	49	28	13	7	3	1.1 ↓	1.0
25-34	171	39	33	13	10	5	1.3	1.0
35-44	149	38	25	21	12	5	1.4	2.0
45-54	119	29	26	25	12	9	1.6	2.0
55-64	92	29	33	15	11	12	1.6	2.0
65-74	21	6	45	24	18	6	1.9*	1.0
Females								
All	1,193	20	35	23	13	9	1.7	1.0
18-24	99	22	32	27	11	8	1.7	1.0
25-34	226	25	40	19	8	7	1.4	1.0
35-44	270	25	37	20	9	8	1.5	1.0
45-54	200	19	27	27	16	10	1.9	2.0
55-64	161	16	31	25	17	11	1.9	2.0
65-74	122	11	34	23	21	10	2.0	2.0
75+	85	9	38	29	11	13	2.0	2.0

** RSE of mean 16-33%*

↓ mean of AHS significantly lower than NSW mean, by age categories

to other age groups, as illustrated by both the mean intake of 2.8 serves per day and the median intake of 2.9 serves per day (compared to 2.0 for all other age groups of women). This 'jump' for this age category is also evident at the state level. The median value indicates that 50% of women in this age group in this AHS are consuming 2.9 serves of vegetables per day.

- Among men, those aged 45-54 years reported the highest intake of vegetables; 33% of this age group consumed three serves of vegetables or more per day.
- Among women, those aged 18-34 years reported consuming the lowest intake of vegetables.
- Mean and median number of serves of vegetables in this AHS for all age groups and for both men and women were lower than the recommended five serves of vegetables per day. Indeed, because the highest serves category of the survey was 'four or more', many fewer people may consume five or more per day. Thus, nearly all adults, but particularly young men and women in this AHS, need to increase their vegetable consumption by at least three serves per day.

Fruit consumption (Table 3C.4)

- The fruit intake of men and women in the hypothetical rural AHS was lower than the NSW state values. Indeed, mean intake was statistically significantly lower for all males in this AHS compared to NSW overall. Overall, 66% of men and 55% of women consumed less than the recommended two or more serves of fruit per day.
- Generally, serves of fruit eaten by people in this AHS increased with age, ie older people ate more fruit.

- At least 50% of males aged less than 45 years consumed only one serve of fruit or less per day (median = 1.0) and over 70% of men in this age category consumed less than the recommended two serves per day.
- The high proportion of men consuming less than the recommended number of serves of fruit in this AHS may reflect the increased likelihood of a larger number of men in this AHS living in remote and very remote areas (see state data in Table 23). This seems likely, as the median intake for all age groups was not different from that for NSW overall. In other words, more men are consuming very low servings of fruit per day. This provides a lower mean, but gives the same median.
- At least fifty percent of men aged 45-74 years consumed the recommended number of serves per day (median = 2.0). This contrasts favourably with the state data, which showed a median of 1.0 for this age group.
- Only 21 men aged 75 years or over participated in the survey, so the data in this age category is not as reliable as other age category data (note the RSE of mean 16-33%), and may not be representative of people in this age group.
- Women generally consumed more fruit than men (compare mean intake of 1.7 to 1.4 serves).
- At least 50% of females aged less than 45 years consumed only one serve of fruit or less per day (median = 1.0).
- Among women, those aged 25-34 years had the lowest intake of fruit; 65% of women in this age category consumed less than the recommended intake of fruit, and their mean intake was only 1.4 serves per day.
- Older women consumed more fruit, particularly those in the 65-74 age group (31% consumed three serves or more of fruit).
- Although fruit consumption is closer to recommended amounts than vegetable consumption, much less than half the population in this area is consuming the recommended two or more serves per day. Increased fruit intake of the whole population is required. Groups that particularly need to be targeted are younger to middle-aged men (those living in remote and very remote areas may have lower intakes), and younger women.

Notes

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